

BULLETIN  
OF THE  
AMERICAN GEOGRAPHICAL SOCIETY.

Vol. XXII

1890

No. 3

CANADA: THE LAND OF WATERWAYS.

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The belief that our earth was made for man is almost universal throughout the civilized world, and many people in both hemispheres are of the opinion that man is likely to reach the highest state of perfection and the greatest degree of comfort on the continent of North America. Yet the prevailing impression seems to be, that very nearly half of this North American continent is almost unfit for human habitation. This rejected half of the continent, which includes the Dominion of Canada, the island of Newfoundland and the territory of Alaska, lies within the same degrees of latitude as the most populous and most progressive countries of Europe; it juts out into the two great oceans, and is hundreds of miles nearer to both Europe and Asia than any other part of the New World. Looking at the map of America and noting the geographical situation of Canada, it seems strange that the early adventurers from Europe passed it by to seek homes in more south

ern latitudes. But this choice of location was not a mere freak. The early voyagers did direct their ships towards the northern part of the continent. They coasted along the dreary shores of Labrador, ventured into the Arctic Ocean in search of a north-west passage to Asia, and contrasting that inhospitable region with the temperate and fertile countries on the opposite shores of Europe made such unfavorable reports that the tide of emigration was turned to the South, very much farther to the South than necessary.

The shape of North-eastern America is not unlike that of North-western Europe. Labrador slopes away from the Atlantic on one side as does Germany on the other; its north-eastern spur, terminating in Cape Chudleigh is another Jutland; Hudson Strait and Ungava Bay are the Skager Rack, Cattegat and Baltic on a little larger scale; Fox Channel and the Gulf of Boothia resemble the Gulf of Bothnia, and Baffin's Land is the counterpart of Norway and Sweden. Perhaps this comparison would not bear very close analysis if the outlines of the different sections mentioned were taken separately, but there is certainly a general resemblance in the contour of the two coasts. But while the climate of North-western Europe is moderated by the Gulf Stream, the Arctic current chills the opposite shore of America. If all countries lying in the same latitude enjoyed the same climate, the temperature of Labrador would be very like that of Germany, the whole Atlantic coast of British America would be well populated and the metropolis of this continent would probably be located in Newfoundland or Nova Scotia, instead of on the island of Manhattan. But climate depends as much

upon local influences as upon latitude. The elevation, the character of surrounding waters, and the prevailing winds must all be taken into consideration. Nature has dealt harshly with Labrador, but it is a great mistake to suppose that she has treated the whole Dominion of Canada in the same way. On the contrary, the greater part of Canada is particularly favored by local surroundings, and these can best be explained by describing the different provinces separately, but in doing this each section will be considered as a part of the whole Dominion.

Newfoundland, the sentinel island of British North America, has not yet joined the Canadian Confederation, but is expected to do so before long. It is twelve miles from the mainland of Labrador, from which it is separated by the Strait of Belle Isle, and its eastern point is only 1,640 miles from Ireland. It has been suggested that Newfoundland might be made a part of the mainland and the ocean voyage from America to Europe reduced to two or three days by closing the Strait of Belle Isle and extending the Canadian railway system to St. John's, Newfoundland. The project has had the support of several eminent engineers and there are said to be no great difficulties to be overcome in carrying out the scheme, as the filling in material lies close at hand. A ship railway would be constructed across the new isthmus above the railway tracks, so that vessels bound for the St. Lawrence could still take the short route. It is claimed that the closing of Belle Isle would turn the Arctic current quite away from the Gulf of St. Lawrence and marvellously moderate the climate of the western coast of Newfoundland, the Maritime Provinces and the part of Quebec lying along the Gulf.

A less formidable scheme is a proposal to construct a railway from Quebec City along the north shore of the St. Lawrence to St. Charles harbor in Belle Isle Strait, from which a fast line of steamships would be run to Europe; and the promoters of the project believe that by bridging the St. Lawrence at Quebec and running fast trains to Belle Isle this line might be made very attractive to travellers subject to sea-sickness and business men who were pressed for time. However, as the country between Quebec City and Belle Isle is always likely to be sparsely populated, such a railway would have to depend almost entirely upon passenger traffic between America and Europe, unless by connecting with the Newfoundland railways it succeeded in greatly developing the trade between Canada and Newfoundland.

Prince Edward Island, the smallest province of the Dominion, lies at the south of the Gulf of St. Lawrence and is separated from the mainland by Northumberland Strait. It is 150 miles in length, varies in width from four to thirty miles, and has an area of 2,133 square miles, almost every foot of which is suitable for cultivation. The soil is naturally very fertile, and the island has a unique advantage in the possession of inexhaustible supplies of natural manure in the form of mussel mud, formed by the decay of oyster, clam and mussel shells in all the bays and river mouths. A good dressing of this mussel mud is said to have a marvellous effect, restoring fertility to the poorest soils. The chief crop of the island is potatoes, but all kinds of grains and vegetables are produced in abundance and all the fruits of the North temperate zone, excepting peaches and grapes, can be successfully grown. The



islanders claim that they have the best fisheries in the Gulf of St. Lawrence, and they are now devoting special attention to the cultivation of oysters. The island is practically without mineral resources, although coal is believed to exist at a great depth. The climate is by no means severe, and the atmosphere is clear, fogs being seldom experienced. In January and February the thermometer sometimes registers as low as fifteen degrees below zero for a few hours at a time, but such cold is exceptional, the average of all temperatures during January and February for seven years being nearly seventeen degrees above zero. A Government railway runs through the province from end to end, with branches in various directions. Northumberland Strait, which is eight miles across at the narrowest point, never freezes over, but the floating ice is often packed so closely during midwinter that it is difficult to maintain communication with the mainland. A Dominion Government steamer runs regularly with mails and passengers, but the islanders will never be satisfied until the Dominion Government undertakes the construction of a tunnel under the strait.

While the people of Prince Edward have always wished to attach themselves to the mainland, they were for many years almost equally anxious to make Nova Scotia an island by cutting a canal through the Isthmus of Chignecto, thus enabling their ships to reach the Bay of Fundy without going around Nova Scotia. But Mr. H. G. C. Ketchum, a New Brunswick civil engineer, suggested that a ship railway across the isthmus would serve all the purposes of a canal, while it could be constructed at less cost and maintained at less expense.

Mr. Ketchum's proposal was approved by the Dominion Government and a large subsidy was granted to a company undertaking the work, which was begun a year and a half ago, and will be completed this autumn. This ship railway runs from Tignish to Amherst, a distance of seventeen miles in a straight line, and is so level that a person standing at one end can see the masts of the ship at the other end. It will carry ships of one thousand tons, and is so designed that with slight alterations it might be adapted to large vessels, Mr. Ketchum does not anticipate that the railway now being constructed will ever be altered to accommodate vessels of more than 1,200 tons, but he thinks another track will be required in a few years for larger vessels. The Bay of Fundy at the terminus of the ship railway would admit, at ordinary high water, vessels of the largest draught, but at the other terminus the limit would be eighteen feet draught at high water, and a very long dredged channel would have to be made for the approach to the hydraulic lift. The channel now provided is three-quarters of a mile long and admits vessels of only fourteen feet draught. By crossing the isthmus, instead of passing through Canso Strait, vessels bound to St. John, N. B., from all points in the Gulf and river St. Lawrence, will save five hundred miles, while there will be a saving of over seven hundred miles as compared with the route around Cape North, frequently taken to avoid the fogs and winds which prevail in Canso at some seasons of the year.

The Bay of Fundy is noted the world over for its peculiar tides, which are generally supposed to be even more extraordinary than they really are. The Canadian

school geographies make them seventy feet, whereas official records show that they never exceed fifty-five feet at any point, and do not average more than thirty feet. The highest rise is along the Chignecto Isthmus and in the Basin of Minas. At St. John the spring tide is twenty-seven feet, and the neap tide twenty-three feet. There are various theories regarding the cause of these wonderful tides, one being that a portion of the warm Gulf Stream seeks an entrance this way to the Gulf of St. Lawrence, and its incoming current is checked and thrown back by the Isthmus of Chignecto. I do not pretend to know anything about it myself, but if this is a branch of the Gulf Stream trying to force its way to the St. Lawrence, it would be interesting to speculate upon the probable effect of cutting a channel for it through Chignecto, and at the same time closing Belle Isle Strait to shut out the Arctic current. Whatever may be the cause of them, these great tidal waves, rushing up the rock-bound bay, turn inward wherever they find an opening made by a river channel, and go roaring up the valleys under the name of tide bores, so that in Nova Scotia river beds, which ordinarily contain nothing but rivulets, are full of water at flood tide. On the New Brunswick side the rivers, being much more important, do not dwindle to rivulets when the tide is out, but there is a very great difference in the volume of water near their mouths at high and low tides. When the tide is out vast muddy flats are left bare, and it is only during spring tide that they are entirely covered. Thousands of acres of these marsh lands near the river mouths, both in Nova Scotia and New Brunswick, have been reclaimed by dyking, and the land thus made available for agriculture is of extraordi-

nary fertility, producing astonishing crops for years without manure. The alluvial mud is sometimes carried to the uplands to be used as manure, and is almost equal to the mussel mud of Prince Edward for fertilizing purposes. The Bay of Fundy has a very foggy reputation among people unacquainted with it, but the records of the keepers of the numerous fog whistles along the bay do not make such a bad showing. An account kept by the keeper of the fog whistle on Partridge Island, at the mouth of St. John harbor, for seventeen years shows that during the six months, beginning with November and ending with April, the fog averaged 19 hours and 22 minutes per month, or only 38 minutes per day. In the summer months the bay is very often foggy, but the channel being wide, deep and free from treacherous shoals or rocks, while there are fog whistles, automatic whistling buoys and light-houses all along the coast, navigation is always safe. During the ten years from 1877 to 1886 inclusive the tonnage of vessels arriving at and departing from St. John was 10,793,846, and the total loss from disasters and casualties in the Bay of Fundy was only  $\frac{26}{100}$  of one per cent.

The Province of Nova Scotia is three hundred and eighty-six miles in length by from fifty to one hundred miles in width, with an area of 20,907 square miles, and extends from the 43d to the 47th parallel of latitude. Its coasts are rugged and uninviting in appearance, and Mr. Herbert Crosskill has compared the province to a splendid painting in a coarse iron frame, but the rough looking frame with its coal, iron and gold, its many commodious harbors and rich fisheries, is as valuable as the fertile interior. Owing to its almost insular position, and perhaps

to the influence of the Gulf Stream, which flows not far from its southern extremity, the climate is very much more moderate than that of the neighboring State of Maine. Extreme cold is seldom experienced in any part of the province, but the northern counties are more exposed to the influence of the Arctic current flowing through Belle Isle than those in the south and along the Bay of Fundy. Thus, Annapolis township, where the climate averages about six degrees warmer than that of the State of Massachusetts, is seven or eight degrees warmer on the average than the counties in Cape Breton and along Northumberland Strait, five or six degrees warmer than Halifax and Colchester counties, and three or four degrees warmer than the famed country of Evangeline, along the Basin of Minas. Yarmouth, the most southern county, has very mild winters. According to the meteorological records at Yarmouth town for the seven years from 1882 to 1888 the minimum temperatures averaged in January and February  $1.3^{\circ}$ ; March  $5.6^{\circ}$ ; April  $21.6^{\circ}$ ; May  $30^{\circ}$ ; June  $38.1^{\circ}$ ; July and August  $42^{\circ}$ ; September  $37.7^{\circ}$ ; October  $28.2^{\circ}$ ; November  $18.4^{\circ}$ ; December  $5.2^{\circ}$ . The average of all temperatures for the seven years from 1882 to 1887 was: in January and February  $25.4^{\circ}$ ; March  $29.5^{\circ}$ ; April  $38.5^{\circ}$ ; May  $47.1^{\circ}$ ; June  $55.1^{\circ}$ ; July and August  $59.8^{\circ}$ ; September  $55.2^{\circ}$ ; October  $47.6^{\circ}$ ; November  $40.2^{\circ}$ ; December  $30.9^{\circ}$ . The average maximum temperatures for seven years were: in April  $59.4^{\circ}$ ; May  $67.9^{\circ}$ ; June  $75.3^{\circ}$ ; July and August  $77.1^{\circ}$ ; September  $72.3^{\circ}$ ; October  $67^{\circ}$ ; November  $58.6^{\circ}$ . The atmosphere of Yarmouth is moist, and the summer temperatures are very much lower than those of the Annapolis Valley. In

Sydney, at the north end of the province, the thermometer sometimes touches thirteen below zero, the average for January and February for seven years being 18.9 degrees above zero, while at Halifax, about half way between Yarmouth and Sydney, the greatest degree of cold experienced in an average winter is between six and seven degrees below zero, the average of all temperatures at that point during January and February for seven years being twenty-two degrees above zero. The winters are short, but, except in the south-western counties, the spring is long and backward, owing to the chilling influence of the ice that drifts through Belle Isle. This is especially true of the island of Cape Breton, which is besieged with drift ice every spring. The climate of all parts of the province is remarkably salubrious, and it is claimed that the average of life is longer than in any other quarter of the globe. According to the census of 1881, the number over eighty years of age in a population of 440,572 was 3,853, while there were twenty-four over one hundred years of age. In New Brunswick, with a population of 321,233, there were 2,227 over eighty, and twelve over one hundred years of age, while Prince Edward Island had eight over one hundred years old, and 883 over eighty years old, in a population of 108,891.

The garden of Nova Scotia is in the Annapolis and Cornwallis valley, a district about eighty miles long and from four to twelve miles wide, protected from the summer fogs of Fundy and the chilling ocean winds by two ranges of hills, known as the North and South Mountains. The North Mountains skirt the south shore of the Bay of Fundy from Briar Island to the

Basin of Minas, terminating in a bold bluff called Cape Blomidon. On the other side of Minas channel the range is continued under the name of the Cobequid mountains, acting as a shield against the cold winds coming from the Gulf of St Lawrence in the spring. The whole Annapolis Valley is an orchard of apples, which command a higher price in the English markets than those grown in any other quarter of the world. In this valley and its extensions there are already about forty thousand acres of apple trees. Thousands of trees are being planted every year, and it is estimated that there are nearly four hundred thousand acres capable of producing the very finest fruit. With forty trees to the acre and each tree averaging four barrels, the wealth producing possibilities of the district are immense. While the climate and soil seem particularly adapted to the production of apples, they are also favorable to peaches, grapes, melons and tomatoes; Indian corn is extensively cultivated, Chinese sugar cane has been successfully grown, and it is alleged that peanuts have been raised and ripened in the open air from seed obtained in South Carolina. King's county, the scene of Longfellow's *Evangeline*, although not quite so warm as Annapolis township, is equally fertile, and the dyked lands are as productive now, after centuries of tillage, as when they were cultivated by the simple Acadians. All the other counties bordering on the Basin of Minas, and those lying along Cumberland Strait and the Gulf, are good agricultural districts. Excepting Yarmouth, none of the counties along the Atlantic coast are generally well adapted for agriculture, although they contain small tracts of excellent farming lands, and no



doubt some of the land, now considered unsuited for cultivation, could be made productive under a system of scientific farming.

Very little wheat is now raised in Nova Scotia, chiefly owing to the fact, that when it was extensively grown some years ago, the weevil was very destructive. Then the deep rich soil of the lowlands is lacking in silica, while the thin soil of the uplands, which used to produce good crops of wheat, has been worn out by cropping and can only be restored to productiveness by means of fertilizers.

The gold bearing rocks of Nova Scotia extend along the Atlantic coast from Canso to Yarmouth, and are estimated to cover about three thousand square miles. Very little capital has been invested in their development, but nearly twenty thousand ounces of gold are annually extracted. Silver, copper, tin, lead, manganese, plumbago and gypsum have also been found in the province, but have not yet been extensively mined. But Nova Scotia has most reason to thank Nature for the stores of coal and iron, with which the province is so richly endowed. The known productive coal fields occupy an area of 685 square miles, the veins being of extraordinary thickness, and there are believed to be considerable areas as yet unproved. The coal is bituminous, of first-class quality, particularly adapted to steam making, and as a rule well suited to the manufacture of iron. The principal mines are in Cape Breton, Pictou and Cumberland counties. The only place in Nova Scotia where iron is systematically mined is in Colchester county, but valuable iron ores exist in many parts of the province, while in Pictou and Cape Breton

counties they lie so close to the coal measures that iron making must eventually become the chief industry. At Londonderry, in Colchester county, two large furnaces are now in blast, and the iron produced is of superior quality, but as the iron works are situated in an inland town, with no water communication and very inadequate railway facilities, while both fuel and iron ore must be carried to the furnaces from a distance, the location does not seem to be particularly good. The best location for iron works in Nova Scotia appears to be in Pictou county. Here four different varieties of iron ore are found in large quantities within a few miles of each other, and are only separated from the coal measures by bands of carboniferous limestones, well adapted for fluxes. The town of New Glasgow is the centre of the Pictou coal district, and either here or at Pictou harbor, a few miles away, will grow up a great iron making city, which will be to Nova Scotia what Pittsburgh is to Pennsylvania.

Along Nova Scotia's five hundred miles of sea-coast are the breeding and feeding grounds of countless millions of fish. Prosperous fishing villages are found all along the rough looking coast, and the annual catch is greater than that of any other Canadian province. The timber resources are great, extensive lumbering operations are carried on, and ship building has always been one of the chief industries of the province, which owns more shipping in proportion to population than any other country in the world.

The railway facilities of Nova Scotia are good. The Government Intercolonial Railway, upon reaching Truro, sends out one branch to Port Mulgrave on Canso

Strait, and another to Halifax. From Canso Strait this Government railway is now being extended to Sydney, Cape Breton, and the work will soon be completed. There are also several railways in the province not controlled by the Government. At present there is no large city in Nova Scotia, although, if the business of the province were more concentrated, it would be sufficient to maintain one. In fact, the great need of Nova Scotia is concentration. There are too many good harbors, too many ports of entry, too many small towns, none of which can afford to provide adequate facilities for the cheap shipment of goods on a large scale. There are eleven harbors open throughout the year, viz.: Halifax, Louisburg, Yarmouth, Annapolis, Barrington, Liverpool, Lockport, Lunenburg, Parrsboro and Shelbourne, besides a host of good harbors which are open nine months of the year, but Halifax and Louisburg are the only ones, whose geographical position makes them available as winter ports for the Dominion at large.

Halifax, the capital of Nova Scotia, and the only city in Canada now occupied by British troops, has a population of about 45,000. It is 594 geographical miles nearer to Liverpool than New York, and has been declared by British naval authorities to possess the finest harbor in the empire. This harbor, which is six miles long, one mile wide, and opens into Bedford Basin, a deep land-locked bay six miles long by four wide, is easy of access and open throughout the year, but vessels are occasionally delayed outside by fogs. Its wharves are extensive, and it has the finest dry dock in the world, capable of taking in Her Majesty's ship *Inflexible*, the



HALIFAX.

largest ironclad afloat. Adjoining this dry dock is a large coaling wharf, with facilities for the rapid coaling of vessels and storehouses containing everything necessary to the rapid fitting out of ships.

Louisburg, Cape Breton, has a magnificent harbor, which is frequented throughout the year by vessels seeking refuge from Atlantic storms. It is close to an immense coal field, and is said to be the only port in America, this side of Vancouver, where coal could be obtained at mine prices in winter. The approach is bold and free from outlying shoals, the entrance being about half a mile wide with a depth of from nine to eleven fathoms of water; and fogs rarely occur in the vicinity. This port is about 750 miles nearer to Liverpool than New York, and vessels making for it avoid dangerous

Sable Island, which those bound for Halifax, St. John, Portland or Boston, must pass. It is nearly 200 miles nearer to Europe than Halifax, and it is claimed that in winter the ocean voyage from Liverpool to Louisburg is practically 300 miles shorter than that to Halifax, so that, if the port were connected with Montreal by a direct line of railway, passengers landing there could be in Montreal many hours earlier than by taking the Halifax route. According to a survey made a few years ago, a direct line of railway between Louisburg and Canso Strait need not exceed eighty miles in length. From Canso to Moncton, New Brunswick, by the Intercolonial Railway, is 248 miles, but a much shorter line could be constructed between the two points. The distance from Halifax to Moncton is 187 miles. During the French *régime* Louisburg was the strongest fortress in America; now it is nothing but an unprogressive hamlet, having no railway connection with the rest of the continent excepting a narrow gauge coal tramway to Sydney. If direct railway communication is established, and the iron resources of Cape Breton are developed, a thriving town may grow up near the site of the old fortress, but it will always have strong competition from the towns of Sydney and North Sydney on opposite sides of the capacious harbor of Sydney, which affords perfect protection to the largest vessels for nine months of the year. Nine coal mines are tributary to these towns, and iron, copper and manganese abound in the vicinity.

New Brunswick adjoins the State of Maine, and is in many respects its counterpart, but it has a much longer coast line, and the surrounding waters tend to moderate

its climate somewhat. There is a pronounced difference between the winter climate along the Bay of Fundy coast, and that of the interior and northern counties. According to the Dominion meteorological records from 1882 to 1888 the minimum temperatures at St. John for seven years averaged: in January and February— $14.5^{\circ}$ ; March— $3.1^{\circ}$ ; April  $16.5^{\circ}$ ; May  $30.1^{\circ}$ ; June  $39.9^{\circ}$ ; July and August  $44.6^{\circ}$ ; September  $35.1^{\circ}$ ; October  $25.8^{\circ}$ ; November  $10.6^{\circ}$ ; December— $1.6^{\circ}$ . The average of all temperatures for seven years was: in January and February  $17.9^{\circ}$ ; March  $26.4^{\circ}$ ; April  $37.3^{\circ}$ ; May  $47^{\circ}$ ; June  $56.1^{\circ}$ ; July and August  $60.4^{\circ}$ ; September  $54.4^{\circ}$ ; October  $45.2^{\circ}$ ; November  $36.1^{\circ}$ ; December  $24.3^{\circ}$ . The average of maximum temperatures for seven years was: in April  $60.7^{\circ}$ ; May  $69.5^{\circ}$ ; June  $77.5^{\circ}$ ; July and August  $83.8^{\circ}$ ; September  $75.3^{\circ}$ ; October  $63.1^{\circ}$ ; November  $56.9^{\circ}$ . At Fredericton, not far from the centre of the province, the greatest degree of cold in an average winter is between 25 and 26 degrees below zero, the average of all temperatures during January and February for seven years being between 12 and 13 degrees above zero, while at Bathurst on the Bay of Chaleur the greatest degree of cold in an average winter is 22 degrees below zero, and the average of all temperatures during January and February for seven years is about one degree lower than that of Fredericton.

The most notable feature of the province is its extensive system of navigable rivers. The chief of these is the St. John, which is navigable for large steamers as far as Fredericton, the capital of the province, 85 miles above St. John City, and for lighter craft as far as the Grand Falls, 225 miles from the sea. It receives a

number of navigable tributaries, and has many lake expansions. In the lower part of its course it is very wide and remarkably deep, but before reaching the harbor of St. John it contracts and passes between two perpendicular cliffs, only three hundred feet apart. About a mile above the city a ledge of rocks stretches across the river, forming a dam, and a waterfall which under ordinary circumstances would necessitate the construction of a canal, but a sort of natural lock is formed by the tides; for at high tide the water level of the harbor is higher than that of the gorge, so that there is a fall inward instead of outward, and at half tide during both rise and fall the water in the gorge is level with the harbor, and vessels can pass through in safety. Besides the St. John, the Bay of Fundy receives the waters of the St. Croix, the Petitcodiac, and a number of smaller rivers. The other important rivers of the province are the Mirimichi, Richibucto, and Nepisiquit, emptying into the Gulf of St. Lawrence, and the Restigouche, flowing into the Bay of Chaleur. Excepting the St. Croix, which is only navigable for sixteen miles from its mouth on account of rapids, all these rivers are navigable for many miles and most of them have a number of navigable tributaries, so that almost every part of the province has communication with the sea. The rivers run through tracts of low-lying alluvial land of remarkable fertility, sometimes extending for miles back from the river, but generally less than a mile wide. These low lands, which are called *intervals*, are partly covered with water in the spring, when the rivers are high. When brought under cultivation, they rank only second to the dyked lands along the coast of Fundy. The total area of the province is seventeen



million acres, and thirteen million acres are estimated to be suitable for agriculture.

Millions of acres in the most fertile sections still remain unoccupied and can be obtained by settlers as free grants, or purchased at very slight cost. New Brunswick does not at present raise enough wheat to supply its own population, although large areas of the province are suitable to wheat culture, and the average yield per acre is estimated at twenty bushels in the Government reports. The farmers in general raise enough wheat for their own consumption, but they seem to find it more profitable to grow hay and vegetables for market, so that the cities and towns are allowed to buy Western wheat and flour. A good deal of attention is now being paid to fruit growing and very fine apples and pears are produced, while the smaller fruits, such as cherries, raspberries, blackberries and blueberries, are raised in great quantities. But the province seems to be particularly adapted to stock raising and dairying, on account of the luxuriant pasturage, unfailing supplies of water and nearness to the markets of both Europe and the Eastern States. Iron ores are found in abundance in various parts of the province, and charcoal can be produced from the forests of hardwood in any quantity desired. There are extensive deposits of antimony, copper and manganese, while lead, silver, gold and tin have been discovered in various sections, but very little capital has been invested in their development and the value of the deposits is unknown. All New Brunswick was at one time a dense forest, and although enormous quantities of timber have annually been cut for many years, there still remain millions of acres of trees which have never

been touched by the axe. These forests are so near to navigable rivers connecting with the sea that the facilities for exporting lumber are unequalled, but it has been argued with some force that, instead of exporting the rough timber, the people of New Brunswick should manufacture it into furniture and all kinds of wooden ware for export. Anthracite coal has been discovered in small quantities in Charlotte county on the Bay of Fundy, and there is bituminous coal in almost every county of the province, but so far as known the seams are all very thin, and the only one that is considered worth mining is at Grand Lake, in Queen's county, where a seam twenty-two inches thick is estimated to extend over an area of 600 square miles. This coal is excellent for steam purposes and is said to be unsurpassed for coking, but there is a streak of sulphur in it which detracts from its value as a fuel for blast furnaces. Compared with the marvellously thick seams of Nova Scotia the coal measures of New Brunswick seem of little value, but they have the advantage of lying much closer to Quebec and Ontario, which are destitute of coal, and it is possible that thicker seams may yet be discovered. Fishing is prosecuted in the Bay of Fundy, and the estuaries of the rivers flowing into it, at all seasons of the year, and in the Gulf of St. Lawrence and the Bay of Chaleur from April to November inclusive, giving employment to thousands of men. The inland waters are full of salmon, trout and other fish which attract sportsmen from all parts of this continent, and even from Europe, the Restigouche, the Mirimichi and their tributaries being especially noted for their salmon.

The most interesting commercial question now before

the Canadian people is the location of the winter port on the Atlantic side of the Dominion. Before confederation the whole foreign trade of Canada passed through American ports during the winter months. After confederation the construction of the Intercolonial Railway made the ports of New Brunswick and Nova Scotia available, but when trade has got into a rut it is difficult to alter its course, and as the Intercolonial Railway followed the line of settlement instead of taking a short and direct route to the maritime ports, St. John and Halifax could not compete successfully with their American rivals, especially as the Dominion Government subsidized a line of mail steamships having its terminus at Portland, Maine, an American port. Now a new order of things has begun. The maritime ports of Canada are connected with Montreal by two short lines of railway, one cutting across the State of Maine, and the other running entirely through Canada, so that the distance is lessened by several hundred miles, and at the same time the Dominion Government has decided that steamship lines subsidized with Canadian money must make a Canadian port their terminus. Consequently a great deal of business, now handled by Boston and Portland, is likely to pass through New Brunswick and Nova Scotia. New Brunswick has many fine harbors, but only those along the Bay of Fundy are unobstructed by ice at all seasons of the year. Of these the ones talked of in connection with the short lines of railway are St. John and St. Andrews. St. John, the metropolis of New Brunswick, is situated at the mouth of the St. John River, which, with its lake expansions and numerous affluents, makes all the central and north-western coun-

ties of the province tributary to the city during the season of inland navigation. The ice which forms in the river St. John is held back by the Narrows above the city, and the high tides make it impossible for ice to form in the harbor itself at any season of the year, so that the harbor is never obstructed by floating ice, and it has never been frozen over. It is claimed that this cannot be said of any other port on the Atlantic coast of America north of Baltimore. St. John harbor is not so capacious as that of Halifax, but the largest vessels can now be accommodated, and the space which can be made available for deep water wharfage by a slight expenditure is almost unlimited. The harbor is easily entered in any weather, so that vessels never have to wait outside on account of fog as they sometimes do at Halifax. The ocean voyage from Liverpool to St. John is about 200 geographical miles longer than to Halifax, but nearly 400 miles shorter than to New York, nearly 200 miles shorter than to Boston, and about 156 miles shorter than to Portland, Me. The distance to Montreal by the Canadian Pacific short line through Maine is 481 miles, the distance from Halifax to Montreal being 758 miles. By the Temiscouata line, running entirely through Canada and connecting with the Intercolonial at Rivière du Loup, the distance from St. John to Montreal is 590 miles, but it is claimed that the grades are much easier than by the line through Maine. It is said that the Grand Trunk company is about to acquire the Temiscouata Railway with a view to extending its line to St. John, so that the three great Canadian railways, the Canadian Pacific, Grand Trunk and Intercolonial are likely to be compet-

ing for the trade of the city before long, and several Provincial railways are also tributary to it. Whether or not St. John becomes the chief Atlantic port for the Dominion, it is certain to be a large city, for its position makes it the natural metropolis not only of New Brunswick, but also of the south-eastern part of Quebec, the fruitful Annapolis Valley of Nova Scotia and all the country around the Basin of Minas, while the Chignecto ship railway will soon make the fertile Province of Prince Edward Island tributary to it. The effect that this ship railway will have upon the future of St. John can scarcely be realized. It is a remarkable fact that the water route from St. John to Montreal will be shortened by 500 miles, almost simultaneously with the reduction of the railway journey by the construction of the two short lines. This practical change in the geographical position of the city is probably unique in the history of commerce. If the Chignecto ship railway and its approaches could be made to accommodate the largest ocean vessels, St. John would be practically as near to Europe as Halifax, and being so much farther inland would undoubtedly become the Liverpool of Canada. St. John is a well-built town and has a lively go-ahead population of about fifty thousand inhabitants, nearly all of whom have confidence in the future greatness of their city. They are particularly proud of the fact that London, Liverpool and Glasgow are the only cities in the British Empire which surpass St. John in numbers, tonnage and size of vessels owned. The central position of St. John makes it the most favorable point for the concentration of the fish trade of Prince Edward Island, Nova Scotia, New Brunswick and the

Gaspé peninsula of Quebec; on account of the cheap timber at its command, it could easily take the lead in the manufacture of furniture and all kinds of wooden ware for the markets of Europe, the West Indies, Central America and South America, if sufficient capital were invested to do business on an extensive scale, while, being surrounded by hills of limestone and having access to unlimited supplies of iron and rock maple in New Brunswick, and inexhaustible mines of coal near at hand in Nova Scotia, it is a favorable point for the making of iron either with charcoal or coke as fuel. During the season of St. Lawrence navigation it could get cheap supplies of iron ore from Quebec and Ontario for mixing with the local ores, if required. In some respects, it would even have the advantage of Pictou county and Cape Breton where coal, iron and limestone lie side by side, for with its competing railways and extensive shipping interests it could get lower freight rates, and the fact that the port is always open would give it an advantage in case of a strike at the neighboring mines, as raw materials could be temporarily obtained from outside points. The Dominion Government proposes to subsidize a line of steamships running between St. John and South American ports, and it is interesting to note that, according to a report published by the Canadian Minister of Public Works, St. John, which is over 2,000 miles nearer to Liverpool than New Orleans, is also over 260 miles nearer to Rio Janeiro or Buenos Ayres than the city at the mouth of the Mississippi, and while Baltimore is about 750 miles farther from Liverpool than St. John, it is only about fifty miles nearer to Rio Janeiro. Of course these figures do

not represent the distances in a bee line, but by the routes for ocean vessels, and the explanation is that ham-shaped South America lies much farther to the East than North America, and its northern coast-line is very long.

St. Andrews, situated on a peninsula projecting into Passamaquoddy Bay at the mouth of the St. Croix River, has a remarkably good harbor, which is almost as free from ice as that of St. John. It is a very pretty place, and American capitalists have taken hold of it with a view to making it a great summer resort.

Moncton, the headquarters of the Intercolonial Railway, from which the railway extends to St. John and various points in Nova Scotia, is likely to be a city of some importance. It is situated at the head of navigation on the Petitcodiac River. All along the Gulf of St. Lawrence are numerous fine harbors, and those of the Bay of Chaleur are particularly good. To describe their advantages, or even mention their names, would occupy too much time, but before passing up the St. Lawrence to Quebec it may be noted that the harbor of Shippegan, which has been very highly praised by Mr. Sanford Fleming, is 148 miles nearer to Liverpool and 271 miles nearer to Montreal than Halifax, and it has been proposed to run a fast line of steamships from this point to connect with a railway across Newfoundland, which would carry the mails to St. John's, whence they could again be transferred to mail steamers bound for Europe. It has been claimed that mails, passengers and light freight could in this way reach the British Isles more quickly than by any other route. However, the harbor of Shippegan is blocked by ice for three months of the year.



The Province of Quebec might with accuracy be included among the maritime provinces, for the Gulf of St. Lawrence is really a part of the Atlantic, and salt water washes the sinuous coasts of the province for nearly 2,500 miles. The influence of the tide is felt at Three Rivers, 900 miles from Belle Isle, and although the great blue river is estimated to pour two million gallons of fresh water into the Gulf every minute, the water is salty at St. Thomas, about thirty-six miles below Quebec City and at Kamouraska, about forty miles farther down, salt was manufactured from the water by evaporation during the French *régime*. But ocean navigation does not end where the water becomes fresh, the largest ocean vessels being able to ascend to Montreal.

The St. Lawrence between Quebec City and the Gulf is from ten to thirty-five miles wide, and very deep. It is skirted on the north by the Laurentian Mountains, which rise in some places near the shore to heights of over 2,500 feet, and on the south by the Alleghanies, whose peaks attain a height of nearly four thousand feet within a few miles of the river. Other countries have their lakes, rivers and mountains, and are washed by sea waves, but Quebec is probably the only one where lake, river and sea mingle between mountains in such a way that no man can tell where lake and river end, or sea begins. There are many depressions in the mountains to let the little rivers through, and at Tadousac, about 122 miles below Quebec City, some great convulsion of Nature has cleft a chasm through a lofty mountain, and almost into the bowels of the earth, giving vent to black and gruesome Saguenay, the deepest river in the world. The bottom of the chasm through which the Saguenay

flows is six hundred feet below the bed of the St. Lawrence, and for over sixty-three miles the sea surges between the mountains to meet the river coming down from Lake St. John, affording navigation for large ocean vessels, while river steamers can ascend to Chicoutimi eight miles farther up, and no doubt the Saguenay could be made navigable for large ocean vessels as far as Chicoutimi. In the vicinity of Quebec City the St. Lawrence River contracts, and the mountains trend away to the north and south, leaving a fertile alluvial valley stretching from Quebec to Montreal. Above Quebec the river is generally about two miles wide, but sometimes contracts to one mile, and here and there expands. To a point forty-five miles above Quebec City the depth is from forty-five to one hundred feet, while from there to Montreal there is a depth of from thirty to fifty feet, except in shoal places, of which there are twenty between the two cities, with an aggregate length of nearly forty miles. To enable ocean vessels to reach Montreal, it has been necessary to dredge channels through these shoals. The longest shoal is where the river expands to form Lake St. Peter, which is nine miles wide, twenty miles long, and has a general depth of from eleven to eighteen feet, with a few deep pools. Along the bottom of this lake a canal has been excavated for seventeen miles, giving a ship channel  $27\frac{1}{2}$  feet deep and from 300 to 450 feet wide. Over fifteen million cubic yards of gravel, sand, clay and rocks were taken out of the lake bottom in making this channel, and you may be sure the St. Lawrence was not dammed up while the work was going on.

The season of navigation on the St. Lawrence varies

somewhat in different years. A record of the opening and closing of navigation at the city of Quebec for sixty-eight years, from 1814 to 1882, shows that the earliest date for the opening of navigation was April 12 and the latest May 11, while the earliest date of closing navigation was the 23d of November, the average season being about seven months. At Montreal the record does not extend over so long a period, but for the ten years from 1879 to 1889 inclusive the earliest opening of navigation for river craft was April 11 and the latest May 5, while the earliest closing of navigation was December 3, and the latest closing the end of the first week in January. The earliest date for the arrival of the first vessel from sea at Montreal during the last ten years was April 27, and the latest May 6, while the earliest date for the last departure of vessels for sea was November 20, and the latest November 28. But many people believe the season of navigation might easily be extended. The river below Quebec City is open throughout the year, but navigation is somewhat obstructed by floating cakes of ice, and along the south shore ice forms in all the harbors. On the north shore for some reason the water is more salt than on the south shore, and the prevailing winds being from the north, what ice forms usually drifts over to the south shore; but the Intercolonial Railway runs along the south shore, and the channel there is better lighted and buoyed, so that it is usually taken by vessels. The Saguenay River for seven miles from its mouth never freezes over, and it has been suggested that Tadousac might be made the winter port of Canada, but there is not room to build a large city there on account of the mountains, and the harbor is sometimes

filled with floating ice in the winter. In the Gulf of St. Lawrence navigation seems to be most obstructed in the spring, when the ice in the many bays along the coast breaks up and floats out, sometimes almost blocking the channel.

Between Quebec City and Montreal the channel does not freeze until an ice bridge is formed by jams of floating ice from the lakes above, or along the shore. It is argued that by means of cribs in Lake St. Louis, above Montreal, an ice bridge could easily be formed at the beginning of the season, which would prevent the lake ice coming down to the harbor, and that if the lake ice were kept back there would be little difficulty in keeping the channel open below Montreal. Hon. Mr. Rhodes, the commissioner of agriculture in the Quebec Government, who has made a study of the river for years, is of the opinion that by keeping four sealing boats, such as the *Alert*, running constantly between Quebec and Montreal, it would be easy to prevent the formation of an ice bridge between the two cities, and he says that river steamers could maintain communication between Montreal and the maritime provinces throughout the winter, while the season of navigation for ocean vessels could be somewhat extended. He believes, too, that, if the river channel were kept open, the climate would be somewhat moderated, and that spring planting would begin at least a week earlier.

Besides the St. Lawrence, Quebec has sixty-nine rivers, with an aggregate length of 6,837 miles. Sixty-four of these, with an aggregate length of 6,504 miles, empty into the St. Lawrence directly, or indirectly through its tributaries; five flow into the Bay of

Chaleur. Because of the numerous rapids very few of these rivers are navigable for long distances, but the rapids do not offer any serious obstacle to floating timber, and they furnish almost innumerable water powers for manufacturing purposes. The Ottawa, St. Maurice, Yamaska, St. Francis and Richelieu are navigable for many miles.

The Richelieu River, the outlet of Lake Champlain, empties into the St. Lawrence at Sorel, forty-six miles below Montreal. To make this river navigable from the St. Lawrence to Lake Champlain for boats drawing six and a half feet of water, it was necessary to construct a dam and a lock one-eighth of a mile long at St. Johns, and a canal twelve miles long between Chambly and St. Johns. From Whitehall, at the lower end of Lake Champlain, the Champlain canal, navigable for vessels drawing 4 feet 2 inches of water, extends to the Erie Canal, making connection with the Hudson River. The distance from Montreal to New York by this waterway is 457 miles, of which only 85 miles is by canals, the remaining 372 miles being open navigation.

The lakes of Quebec have never all been named or numbered. There are thousands of them, all abounding in fish. They are scattered throughout the province, but seem to be most numerous in the territory lying between the Saguenay and St. Maurice rivers, and extending from Quebec to Lake St. John. Here land and water are mixed together in just the proper proportions to make it the paradise of sportsmen, and since the completion of the Quebec and Lake St. John Railway, the district is easily accessible to tourists. Lake St. John itself is 28 miles long, and to the north-east of

it lies mysterious Mistassini, for many years supposed to be of vast extent, but recently proved to be only about one hundred miles long.

Quebec Province is estimated to have a land surface of about 120,000,000 acres after deducting the area occupied by lakes and rivers. How much of this vast territory is suitable for cultivation is a matter of conjecture, for the greater part of it is an unsurveyed wilderness. About twenty-nine million acres have been surveyed and divided into farm lots, and of this area about twenty-two million acres have been sold or allotted in free grants, leaving about seven million acres of surveyed public lands still undisposed of, besides the great northern wilderness, of over ninety million acres, which has not been surveyed.

A territory of such an area of course has a varied climate. At Montreal, according to the meteorological records for the seven years from 1882 to 1888, the greatest degree of cold experienced, during January and February of an average winter, is—22.6°; March—8.9°; April 13.5°; June 45.4°; July and August 46.9°; September 36.7°; October 25.1°; November 8° and December—14°. The average of all temperatures for seven years was, in January and February 11.4°; March 20.9°; April 37.8°; May 53.8°; June 64.9°; July and August 67.4°; September 57.3°; October 44.5°; November 32.2°; December 17.7°. The average maximum temperature for seven years was, in April 67.6°; May 77.9°; June 85.3°; July and August 85.5°; September 79.6°; October 68°; November 59.4°. In Quebec City the greatest degree of cold experienced during the months of December, January, February and March, is

between one and two degrees lower than in Montreal. The average of all temperatures during January and February is several degrees higher than in Montreal, but in all the other months the average temperature is several degrees lower than at Montreal, and the season without frost is nearly three weeks shorter. The Lake St. John district affords a very good illustration of the fact that climate depends more upon local influences than upon latitude. Although situated one hundred miles north of Quebec City, its temperature averages several degrees higher and the summer is several weeks longer. There is a large area of good wheat land in this district, and it is now being rapidly settled. Another northern district that has made great progress of late is in the vicinity of Lake Temiscaming on the boundary of Ontario, about three hundred miles north-west of Montreal. The climate is about the same as at Quebec City. The section of the province bordering on the lower St. Lawrence, partly owing to its mountainous character and partly to the influence of the Arctic current flowing through Belle Isle, has a rather severe climate, and is not generally well suited to agriculture. The country north-east of Anticosti is little better than Labrador, and Anticosti itself is generally considered scarcely fit to live in. West of that the climate is better, and there is a good deal of fertile land in the valleys, but on the whole the country along the river, below Quebec City, offers no special attractions to agriculturists. However, all the numerous indentations of the coast swarm with fish, and the fishing industry, already extensive, is capable of great expansion. The islands in the river west of Anticosti are all fertile.



Orleans Island, below Quebec City, has always been noted for its grapes. The best agricultural region of the province is the fertile valley extending on both sides of the river from Montreal to Quebec City, and reaching as far as Kamouraska, on the south shore, with a total area of nearly twelve thousand square miles. This was once a great wheat producing region, but it has been to some extent exhausted by over cropping. Indian corn is cultivated in the south-west, and throughout the valley apples are grown, while grapes are produced in the open air as far east as L'Islet on the south shore, 70 miles north-east of Quebec City.

One of the most flourishing branches of agriculture in this province is tobacco growing. Tobacco culture on a small scale is quite common, and there are a few large plantations. Mr. F. A. Med Foucher, of St. Jacques de l'Achigan, in Montcalm county, has tried forty varieties of tobacco, and has had remarkable success with twenty-two varieties. Fourteen varieties which he exhibited at the Indian and Colonial Exhibition, in London, in 1885, won the highest praise from the judges. Mr. Med Foucher declares that during the last ten years he has annually grown from 12,000 to 40,000 lbs. of tobacco, and during that time he has never lost more than 150 lbs. from frost in any one year. Tobacco can be successfully grown in this province as far east as Quebec City. About 2,500,000 pounds of tobacco are annually grown in Canada, and the greater part of this is produced in Quebec Province. But the Province of Quebec is probably better suited to stock raising than any other branch of farming. Good grazing land, watered by springs, streams and lakes, abounds

almost everywhere from Lake St. Francis to the extremity of Gaspé. It is not, and never can be a ranch country; the snow lies too deep in winter, but proximity to European markets and cheap transportation largely offset the cost of winter housing. Dairy farming is now attracting special attention, and in the district between the St. Lawrence River and the American boundary, commonly known as the "Eastern Townships," there are already many fine herds of cattle, with some of the best blood in America.

Quebec has still an immense area of uncut timber, and if indiscriminate destruction is provided against, this may prove the most valuable asset.

There is no coal in Quebec Province, but there are many deposits of iron. The richest beds yet discovered are in the County of Ottawa. Near the Gatineau River, within a few miles of the city of Ottawa, is a hill of magnetic iron, which has been estimated to contain 100,000,000 tons of accessible mineral of the best quality. Eight miles north-east of Ottawa City is the "Haycock" mine of hematite ore, where Professor Chapman estimates that there could be an output of 100 tons of ore per day for 150 years, without exhaustion. There are believed to be other rich beds in the neighborhood. Deposits of iron ore have also been found in many other parts of the province, including the Eastern Townships. At Moisie there are immense beds of very valuable iron ore, and large quantities of bog iron ore of remarkably good quality are found in the district of Three Rivers.

Discoveries of both gold and silver have been reported in many parts of the province, but seldom in paying

quantities, and very little of either has been mined. Geologists say there is gold in many of the rivers and that rich deposits exist in Beauce, Compton, and surrounding counties, but the total value of the gold mined since confederation amounts to less than half a million dollars, and the output has never exceeded 3,300 ounces in one year. Most of the silver taken out is found in the copper ores, which are widely scattered throughout the province, and are very valuable in some sections. Copper is now mined on an extensive scale in the Eastern Townships and the annual output is between two and three million pounds. In Megantic, Richmond and Wolfe are large deposits of what is pronounced the finest asbestos in the world. Several companies are now engaged in mining it, and most of the output is exported, being manufactured into all kinds of fireproof clothing and building material. There are deposits of apatite, or phosphate of lime, in various sections, the richest mines being located in Ottawa county. This county is probably the richest mineral district of the province. Its extensive deposits of iron ore have already been referred to. Mica is found, and the plumbago mined here is said to be better suited to the making of crucibles than any found elsewhere, excepting that produced on the island of Ceylon.

The farms of Quebec Province are generally long narrow strips of land, frequently having a frontage on some river road, with houses and outbuildings near the river banks, so that the farm houses stretch for miles along the rivers, looking like continuous villages; and just as the rivers of the province here and there spread out into lakes, so these straggling farm villages at certain points

expand, and become towns and cities with varied industries. Most of these towns are only of provincial importance, but the trade of the whole Dominion is largely tributary to Montreal, and to some extent to Quebec City. Quebec City in its historical and picturesque aspects is probably better known to the world at large than any other town in Canada. Its quaint, old-fashioned streets, its impregnable fortress, and the grandeur of the surrounding scenery have so often been described by tourists that every one is familiar with them. It looks like a fossil town of the seventeenth century, and one might expect to dig it out of a rock rather than to find it perched on top of one. But it is neither so old nor so slow as it looks. It is true that a good sized town was there when the rest of Canada was a wilderness, and many of the old houses stand to-day, but a new city, fashioned after the old models has grown up around them, and during the last ten years the increase in population in the city and suburbs has been considerable, while in tanning, shoe making, and several other lines of manufactures, the growth has been quite remarkable. The beautiful Montmorency Falls near the city are now being utilized to generate power for manufacturing purposes.

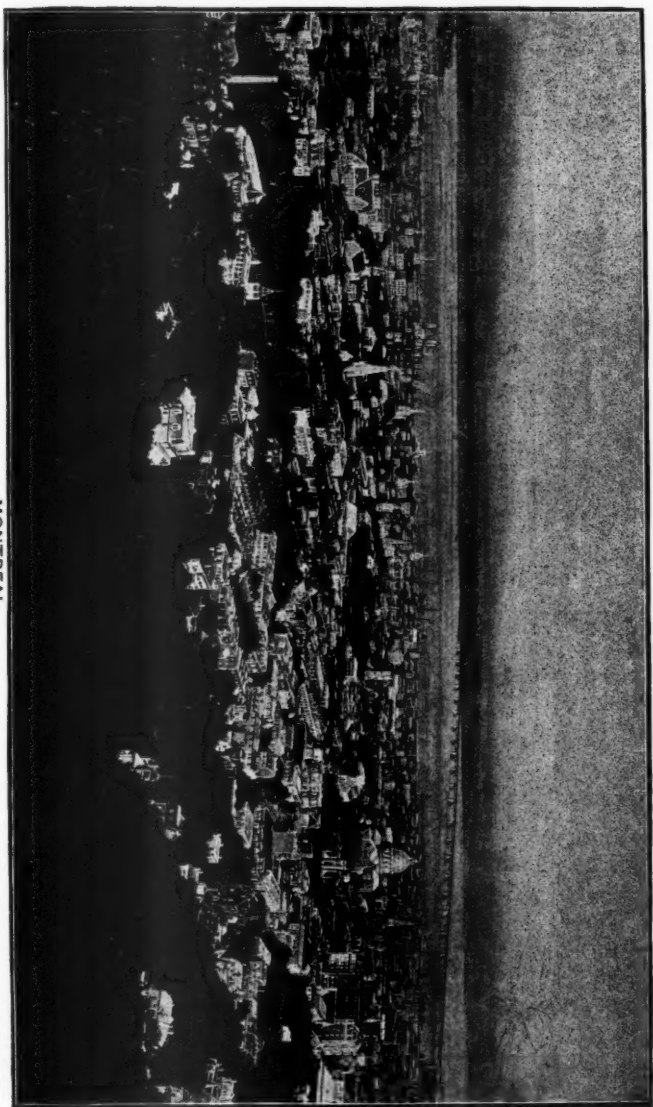
But although Quebec is not quite so slow as appearances would indicate, it cannot yet be classed among the enterprising cities of Canada. However, its citizens are at least active in trying to secure Government assistance for a railway bridge across the river at this point, and such a bridge is certain to be built sooner or later. Connection with the south shore is now secured by a ferry from Quebec to Levis, just across the river. At present the

only railways between Quebec City and the North-west run through Montreal, but the Quebec and Lake St. John Railway is to be extended westward to Lake Temiscaming, and eastward to Port Alphonse on the Saguenay, ten miles below Chicoutimi, and it is claimed that this railway with its connections will reduce the distance between Quebec City and the North-west by 160 miles, and that it will run through a fertile country which will become tributary to Quebec City. When the St. Lawrence is bridged, this railway, in connection with the Temiscouata Railway, will also give St. John, N.B., and Halifax, a line to the North-west entirely through Canadian territory, considerably shorter than the Canadian Pacific Railway, a part of which runs through Maine.

It is no exaggeration to say that Montreal, the commercial metropolis of Canada, has the most remarkable situation of any city in the world. Located on an island at the confluence of two great rivers, one of which is the outlet of a system of vast lakes, although 960 miles inland, its harbor can be reached by the largest ocean vessels. Around the upper part of the island the two great rivers form lakes, affording harbor room for an immense fleet of lake vessels, and then the St. Lawrence descends to the lower harbor in extraordinary rapids, which make it impossible for ocean vessels to pass the city to the lakes above, and at the same time generate power sufficient to run all the machinery in a great city, while the Ottawa, dividing into two rapid streams, runs down at the back of the island, thus providing another water power and a waterway for floating timber, without obstructing the harbor of Montreal. Eventually the city will certainly spread over the whole island, which is about 32 miles long

and four to eight miles wide, but at present it occupies only a small part of it, being built on a series of terraces between the river St. Lawrence and Mount Royal. Solid, conservative yet progressive, it has always been prosperous, but in the past a lack of public spirit has somewhat retarded its growth. Now, however, the desire for improvement seems to animate the whole community; millions of dollars are to be expended on harbor improvements, narrow streets are being widened, good pavements are being laid, and every street is brilliantly lighted with electricity. Being built entirely of stone and having many fine squares, substantial business blocks, magnificent residences, large churches and numerous colleges, with the green mountain park in the background and the great blue river flowing by, the city is certainly one of the most beautiful in America, and when the projected improvements are completed every Canadian may justly feel proud of it. The population in 1881 was 140,000; in January, 1890, the assessors estimated it at 240,000, and there are believed to be from 25,000 to 35,000 people in the suburbs, which have grown up around the city since the last census. On reaching Montreal one first realizes that Quebec and Ontario are geographically one. Commercially this city belongs to Ontario rather than to Quebec Province, and the extraordinary advantages of its situation cannot be appreciated without a knowledge of Ontario's agricultural and mineral resources, its great natural waterways and its extensive system of canals.

The Province of Ontario is the section of the Dominion lying between the great lakes and Hudson Bay. A territory as large as New York, Pennsylvania, Ohio and Michigan combined might be cut out of it, and



MONTREAL.





there would still remain thousands of square miles. The exact limits have been for years a matter of dispute between the Dominion and Provincial governments, but, according to the award of the boundary commission, its boundary extends from the Lake of the Woods and Winnipeg River, along the English River, through Lac Seul and Lake St. Joseph and along Albany River to James Bay, the southern shore of which it follows to a point due north of Lake Temiscaming. Running down to Temiscaming, it follows the Ottawa River to a point within a few miles of Montreal, and then strikes over to Lake St. Francis and extends along the St. Lawrence River to Lake Ontario, whence it spreads along the whole length of the great lakes as far as Pigeon River which, rising near Rainy River, empties into Lake Superior.

Through the province from Lake Abittibe to Lake St. Joseph runs a height of land from 1,000 to 1,500 feet above sea level, on the southern slope of which are the sources of the rivers which empty into the great lakes and St. Lawrence River, while those flowing into Hudson Bay rise on its northern slope. The most peculiar natural feature of Canada is its system of river reservoirs, and this is most strikingly marked in the Province of Ontario. The rivers in general are very irregular in their course, and at almost every turn in them is located a reservoir in the form of a lake, the stretches of river between the lake reservoirs being each known by a different name. The system is shown on a large scale in the St. Lawrence River and the great lakes. The St. Lawrence proper may be said to begin at Montreal, the head of navigation for ocean vessels,

but the great river has its source somewhere in the wilderness of Northern Ontario and its first big reservoir is Nepigon, a large lake of pure blue water, the outlet of which is Nepigon River flowing into the second reservoir, Lake Superior. Between Nepigon and Montreal there are seven such reservoirs connected by stretches of the St. Lawrence River under different names. This peculiarity is imitated throughout the province by numerous other rivers, sometimes almost in miniature, sometimes on a scale nearly approaching that of the St. Lawrence and great lakes. Often the lake reservoirs of one irregular river are so close to those of another river system that a short portage, or a few miles of canaling, will shorten navigation by many miles.

At Sault St. Marie the level of Lake Superior is 591 feet above the St. Lawrence at Montreal, and the water reaches the lower level by one great fall at Niagara, and a series of rapids at different points which necessitated the construction of a number of canals. The Sault St. Marie rapids are avoided by a canal a mile long on the American side of the river, and a similar canal with a depth of eighteen feet at lowest water, is now being constructed on the Canadian side, and is to be completed in May, 1892. There are seven canals, between Lake Erie and Montreal, having an aggregate length of  $70\frac{1}{2}$  miles, with 53 locks, overcoming a height of  $533\frac{1}{4}$  feet. These canals were first designed for vessels drawing only nine feet of water, but some years ago it was decided to enlarge to a scale of fourteen feet. The Welland Canal,  $26\frac{3}{4}$  miles long, connecting Lakes Erie and Ontario, and the Lachine Canal,  $8\frac{1}{2}$  miles long, overcoming the Sault St. Louis, or Lachine rapids,

above Montreal harbor, have been enlarged to the new scale, but the five canals between them have only a depth of from nine to ten feet of water on the sills at ordinary water level, and at extreme low water the depth is reduced to seven feet in two of them. The work of enlarging the Cornwall Canal is well under way, and in a few years all the canals on this route will have the same depth as the Welland, so that vessels drawing 14 feet of water will be able to come to Montreal from Chicago, Port Arthur and Duluth. But so sure as any two sides of a triangle are together greater than the third side, vessels from Michigan and Superior will not always circumnavigate the south-western peninsula of Ontario to reach Montreal. The head of Georgian Bay is less than 123 miles from the Ottawa River. Between them stretch French River, Lake Nipissing, Lake Turtle, Lake Talon, Lake Trout and the Mattawan River. Less than eight miles of canaling would ensure a continuous waterway, but to enable large vessels to reach Montreal the Ottawa River canals would have to be enlarged.

Many years ago Mr. Walter Shanly, the well-known engineer, surveyed the route and estimated the cost of a waterway from Montreal to Georgian Bay, with a depth of twelve feet, at \$24,000,000, including the cost of enlarging the Lachine Canal, which was then of very limited capacity. A little later, Mr. T. C. Clarke, another eminent civil engineer, estimated that a waterway navigable for vessels drawing twelve feet of water could be made between Georgian Bay and Montreal at a cost of \$12,000,000, not including the cost of the Lachine Canal, which is already reconstructed on the

enlarged scale. The distance between Montreal and the mouth of the French River would be 430 statute miles, of which 30 miles would be canals with 69 locks. From the mouth of the French River to Sault St. Marie the distance is 190 statute miles, making the whole distance between Montreal and Sault St. Marie by this route 620 statute miles, as compared with 1,000 miles by the lakes and St. Lawrence River. The distance from Buffalo to Sault St. Marie is 600 miles. Thus, by taking the Ottawa route between Montreal and Lake Superior, vessels would save a voyage of nearly 400 miles through stormy lakes. There would be a similar saving in distance between Montreal and Chicago, and the two cities would be brought within 971 miles of each other, so that ocean vessels in the port of Montreal would be practically as near to the elevators of the great Western metropolis as the Erie canal boats at Buffalo.

It goes without saying that the carrying out of this scheme would give Montreal the control of the grain trade, and just below the point where the grain-bearing ships would reach Montreal island are the Lachine rapids, with power enough going to waste to run all the flour-mills in America. On the French and Ottawa rivers open navigation can be depended upon from May 5 to December 1, and the season is sometimes longer. The St. Lawrence route is open a little longer, but Mr. Walter Shanly estimates that vessels could make at least three trips more in a season between Chicago and Montreal by the Ottawa route than by the St. Lawrence route, owing to the shorter distance. The river between Montreal and Ottawa City is now

navigable for vessels drawing nine feet of water, the rapids being overcome by three short canals, having an aggregate length of  $6\frac{5}{8}$  miles, with eight locks. Above the capital city several locks and dams have been constructed to overcome rapids. It has been assumed that to compete with the St. Lawrence route the Ottawa canals must be made of the same dimensions as the new Welland—that is, fourteen feet deep, Mr. Clarke's estimate being for canals twelve feet deep. For my own part I am inclined to believe that a better plan would be to continue the Ottawa canals to Lake Nipissing on the present scale of nine feet, and enlarge the dimensions of the Sault St. Marie Canal to twenty or twenty-five feet. Then ships as large as the great ocean vessels could run between Lake Superior ports and French River, where they would transfer their cargoes to small steamers running down the Ottawa to Montreal. On this scale continuous navigation between Georgian Bay and Montreal could be established at comparatively slight cost, and the largest vessels that are now able to reach Montreal from the Upper Lakes could come down the Ottawa, for practically a canal system is only as large as its smallest lock, and some of the canals on the St. Lawrence route have not yet been enlarged, as already stated. Vessels drawing seventeen feet of water can pass from French River to Sault St. Marie by the sheltered channel north of the islands. There is a slight obstruction at one point, but it is to be removed this year. No doubt this channel could be made to accommodate vessels of the largest size. It would be worth while to consider whether connection could not be made between Nipissing and the Ottawa

more cheaply by a ship-railway than by a canal. In connection with the Ottawa and Georgian Bay Canal scheme it has been proposed to construct a canal for vessels drawing nine feet of water from Caughnawaga, opposite the upper end of the Lachine Canal, to the Chambly Canal, which would be enlarged for a distance of about nine miles to the port of St. John's, Quebec, and it has been estimated that the whole work could be completed for about five million dollars. At considerably less expense a canal with a depth of seven feet could be constructed from Caughnawaga, and if the State of New York would enlarge the Champlain Canal to the same scale as the Erie, grain for New York could be loaded into barges at Montreal instead of at Buffalo, saving hundreds of miles of canalage as well as a long lake voyage. The distance from New York City to Montreal harbor would be 394 miles, of which 105½ miles would be by canal, and the remainder open navigation. The distance from New York to Chicago by this route would be about 150 miles shorter than *via* the Erie Canal and Buffalo. But the best scheme for a waterway between Montreal and New York seems to be the proposed canal from Longueuil, opposite Montreal harbor, to the Richelieu River. The distance would probably be a little shorter than by the Caughnawaga route.

On a summit of land between the Ottawa River and the lower end of Lake Ontario is a series of small lakes, some of which discharge their waters into the Rideau River, emptying into the Ottawa River at Ottawa City, while the others empty into Lake Ontario at Kingston through the river Cataraqui. By connecting and im-



proving these two river systems, continuous navigation for boats drawing  $4\frac{1}{2}$  feet of water has been established between Ottawa City and Kingston, a distance of  $126\frac{1}{4}$  miles. Even this canal is to a certain extent useful to Montreal as it furnishes an alternative route to Lake Ontario for small boats. The distance between Montreal harbor and Kingston by the Ottawa and Rideau route is  $248\frac{5}{8}$  miles, while by the St. Lawrence route it is only 178 miles, but not long ago when there was a breakdown on the Cornwall Canal, temporarily stopping navigation on the St. Lawrence route, the blockade was partially relieved by loading grain and other produce into Rideau barges. Another scheme to avoid the navigation of Lakes Ontario, Erie and Huron and shorten the distance between Montreal and Georgian Bay, is known as the Trent Valley Canal, in making which it is proposed to utilize the series of bays, rivers and small lakes which stretch across Ontario almost continuously from the Thousand Islands to Lake Huron, beginning with Quinte Bay, which extends from near Kingston to Trenton at the mouth of the Trent River, and ending with the Severn River, which flows out of Lake Simcoe into Georgian Bay. To connect the waters which drain into Quinte Bay, with those draining into Lake Simcoe, only  $13\frac{3}{4}$  miles of canal would have to be cut, but eleven small lakes and four rivers would be embraced in the scheme of navigation, and to overcome rapids several other very short canals are necessary. The distance between Quinte Bay and Georgian Bay by this route would be 235 miles. A good deal of money has already been expended in improving navigation on this Trent system of rivers and lakes, and

within a few years there will probably be navigation between Quinte and Georgian bays for boats drawing five feet of water. The western end of Quinte Bay has been connected with Lake Ontario by cutting through Murray Isthmus a canal without locks,  $4\frac{1}{2}$  miles in length, 80 feet wide and 11 feet deep at lowest water. The people of Toronto for many years discussed a proposal for a canal connecting Georgian Bay and Lake Ontario at Toronto, but this scheme seems to have been displaced by a project for a ship-railway which Mr. Kivas Tully is engineering. The distance from the mouth of the Humber at Toronto to the mouth of the Nottawasaga River, Georgian Bay, is 66 miles. The grades are said to be very favorable and it is estimated that a ship-railway with three tracks, capable of transporting a ship weighing 2,000 tons, including vessel and cargo, at the rate of ten miles per hour, could be constructed for twelve million dollars. This ship-railway would save hundreds of miles of dangerous lake navigation and 28 miles of canal between Chicago and Montreal, and its promoters claim that a vessel from Chicago, Port Arthur or Duluth, taking this route, could reach Montreal before one going around by Lakes Huron, St. Clair and Erie could reach Buffalo, and that even vessels bound for Buffalo would find it advantageous to pass through Toronto and the Welland Canal rather than go around by Detroit. Of course the successful operation of such a railway would be of great advantage to Oswego, as well as Toronto, but Montreal would probably derive the chief benefit. However, the construction of the Ottawa and Georgian Bay canals would be much more advantageous to Montreal, not

only because the route would be somewhat shorter, but also because it would completely avoid the attractions of Buffalo, Oswego and Ogdensburg. A vessel passing through Toronto might unload at one of the American lake ports, but a vessel passing through Ottawa must unload at Montreal. But whatever route ships from the North-west may ultimately take, it is certain that railway traffic from both the American and Canadian North-west will come down to Montreal through the Ottawa Valley. The Canadian Pacific Railway's short line to the "Soo" is already in operation, and is bringing an immense amount of American business to Montreal, while the Grand Trunk is likely to take the same short cut very soon, and other railways are sure to follow the example. But this is not the only short cut through Ontario for American traffic. The nearest way from Buffalo to any point in Michigan is through the south-western peninsula of Ontario, and for all the country which sends its exports to Europe through Chicago, the shortest route to the sea-board is by the Grand Trunk and Canadian Pacific lines, crossing Detroit Strait and passing through Southern Ontario to Montreal. Besides the through lines, Ontario has many local railways, most of which are branches of the two great trunk lines, and the southern part of the province is a net work of railways.

The Ottawa River above its tributary, Mattawan, has many lake expansions and one of them, Lac des Quinze, is not far from the height of land, on the other side of which lies Lake Abittibe. Between Lac des Quinze and Abittibe stretch several small lakes and rivers having a total length of about 66 miles, and the watershed between the two systems is less than a mile in

width. It would be worth while to have this route surveyed by skilled engineers to ascertain what it would cost to improve the upper Ottawa and connect it with Lake Abittibe, although it would not be advisable to undertake such a work until the northern country becomes populated. No doubt a waterway for barges of the Erie Canal scale could easily be made, and perhaps vessels of a larger class could be accommodated. The Abittibe River carries the outflow from Lake Abittibe down to James Bay at Moose Factory, meeting there the Moose River, which has two branches, the Matagami, rising in Lake Kenogamissie, and the Missinibe, flowing out of Lake Missinibe. Lake St. Joseph's outlet, the Albany River, empties into the bay at Fort Albany in latitude 52 degrees 8 minutes north, about one hundred miles north-west of Moose Factory. For six months of the year, all these rivers are navigable by large vessels for hundreds of miles. The Albany River has several navigable tributaries with numerous lake reservoirs, and these approach so close to both Long Lake and Lake Nepigon that it would not be very difficult to make connection with Lake Superior. Besides the Ontario rivers, James Bay receives from the west the Attahwahpiskat River of Keewauw, navigable for about 300 miles, from the east the East Main River, and from the south-east Lake Mistassini's outlet, the Rupert River.

James Bay is 300 miles long with a width of about 150 miles and is so shallow that, excepting a channel down its centre, the muddy bottom may be touched with an oar by a person rowing in a small boat, when almost out of sight of land, and in the southern part of it the water is so muddy that fish cannot live there, while it

is almost free from saline matter, owing to the volume of fresh water poured into the bay from the great rivers of which it is the outlet. The deep ship channel runs northward like a river in nearly a straight line from Moose Factory at the south of James Bay to Mansfield Island in Hudson Bay. Directly south of James Bay is a low, level, swampy basin bounded by distinct veins of hard rocks, the rim being high with a steep slope toward the centre, and the thought is suggested that this basin once contained a lake, which was the reservoir of all the rivers rising on the northern slope of Ontario's Height of Land, while what is now the ship channel of James Bay was a great river, carrying the waters of the lake through a long valley to Hudson Bay, receiving on its way several large tributaries. Such a lake, bursting from its bounds and spreading over the valley to the north of it, would form the shallow, muddy James Bay.

The climate of Ontario varies considerably according to latitude and elevation, but the variations are not so great as might be expected considering the vast area of the province. According to the records of the Dominion Meteorological Department for the seven years from 1882 to 1888 in Hamilton, at the head of Lake Ontario, the minimum temperatures averaged in January and February—11.8°; March—2.3°; April 16.8°; May 29.1°; June 37.8°; July and August 39.5°; September 32.5°; October 20.9°; November 10°; December—1.1°. The average of all temperatures for seven years was in January and February 21.7°; March 28.8°; April 42.3°; May 55.1°; June 64.1°; July and August 69.8°; September 62.6°; October 50.2°; November 38.5°; December 28.8. The

average of maximum temperatures for seven years was in April  $78^{\circ}$ ; May  $83.6^{\circ}$ ; June  $88.4^{\circ}$ ; July and August  $94.5^{\circ}$ ; September  $88.4^{\circ}$ ; October  $77.7^{\circ}$ ; November  $67.2^{\circ}$ . At Moose Factory, on the southern shore of James Bay at the far north of the province, the minimum temperatures for seven years averaged in January and February— $38.5^{\circ}$ ; March— $26.5^{\circ}$ ; April— $8^{\circ}$ ; May  $16.9^{\circ}$ ; June  $28.6^{\circ}$ ; July and August  $36.4^{\circ}$ ; September  $30.9^{\circ}$ ; October  $13.1^{\circ}$ ; November— $8.9^{\circ}$ ; December— $25.1^{\circ}$ . The average of all temperatures for seven years was in January and February— $0.8^{\circ}$ ; March  $11.8^{\circ}$ ; April  $25.2^{\circ}$ ; May  $43.9^{\circ}$ ; June  $52.4^{\circ}$ ; July and August  $60.9^{\circ}$ ; September  $51^{\circ}$ ; October  $39.1^{\circ}$ ; November  $21.3^{\circ}$ ; December  $9.9^{\circ}$ . The average of maximum temperatures for seven years was in April  $54.4^{\circ}$ ; May  $75.7^{\circ}$ ; June  $84.9^{\circ}$ ; July and August  $88.6^{\circ}$ ; September  $74.7^{\circ}$ ; October  $72.8^{\circ}$ ; November  $46.7^{\circ}$ . The greatest degree of cold experienced in an average winter at Windsor, near the southwestern corner of the province, is— $10^{\circ}$ ; Toronto— $16.1^{\circ}$ ; Ottawa— $26.9^{\circ}$ ; Owen Sound— $28^{\circ}$ ; Port Arthur— $35.6^{\circ}$ . The average of all temperatures during the months of January and February for the seven years was  $22.5^{\circ}$  at Windsor;  $19.6^{\circ}$  at Toronto;  $9.8^{\circ}$  at Ottawa;  $16.2^{\circ}$  at Owen Sound;  $2.8^{\circ}$  at Port Arthur. It will be noted that the temperature at Moose Factory, on the southern shore of James Bay, during the coldest winter months is not three degrees lower than that of Port Arthur, on Lake Superior. During the spring and early summer Port Arthur's temperature is five or six degrees higher, while in July, August, September and October the temperature at the two points is almost precisely the same. A slightly higher temperature prevails throughout the

district lying between the Height of Land and James Bay than at Moose Factory, but along the Height of Land the winters are somewhat colder, the difference in latitude being offset by the lower elevation as the country slopes toward James Bay. It is believed also that the many small lakes in this northern part of the province tend to moderate the climate. The thermometer never registers quite so low in the most northern part of Ontario as it does in Minnesota, Dakota, Montana or Manitoba, and, what is even more important, cyclones and blizzards are never experienced in any part of Ontario. Because Hudson Strait is blocked with ice in summer it is commonly supposed that any district bordering on Hudson Bay must be practically without summers, but when it is remembered that Hudson Bay is 825 miles long, while the strait to the north-east of it is 500 miles long, it can be imagined that the ice in the far north does not affect the south shore of James Bay to any great extent. In fact Hudson Bay proper never freezes over in winter, and, even as far north as Churchill, ice never extends far enough from shore to intercept the view of open water. The temperature of the bay is several degrees warmer in winter than that of Lake Superior. James Bay on account of its shallowness does freeze in winter, but the ice breaks up in the spring.

The population of Ontario, which is now estimated to be two millions and a half, is nearly all concentrated in the country south of Lake Nipissing, all of which is compactly settled, excepting the district between Georgian Bay and the Ottawa River, where the population is still sparse. The section between Lake Nipissing and Sudbury is being rapidly settled, little commu-



nities are growing up here and there along the line of the Canadian Pacific Railway from Sudbury to Port Arthur, and there is a small settlement between Lakes Temiscaming and Abittibe, but the whole country north of the Canadian Pacific Railway's main line may be described as a wilderness. Of the wilderness north of the Height of Land very little definite information can be had, but it is known to be heavily timbered, and from the reports of Government geologists and surveyors it is learned that while some parts of it are rocky and others swampy, there are vast areas of fertile land, while valuable minerals abound. The only settlers are the Hudson Bay Company's officers, and they do not devote much attention to agriculture, but there are small farms or gardens around nearly all their posts and from these some idea may be obtained of the agricultural possibilities of the country. At Moose Factory fine crops of oats, barley, peas, beans, tomatoes, turnips, potatoes, beets, carrots, cabbage, onions, lettuce, spinach and radishes are grown every year without any special care, and wheat has been successfully ripened there, but it is not usually grown at the Hudson Bay posts north of the fiftieth parallel of latitude, up to which point it is a regular crop. Strawberries, raspberries, gooseberries, red and black currants and huckleberries, grow in great profusion throughout the district. Owing to the abundant supply of water, the luxuriance of the native grasses and the adaptability of the soil and climate for root-growing, this part of the province is especially suitable to stock-raising and the dairy industry. However, the lumberman and the miner will probably be the pioneers, for the ordinary farmer pre-

fers a prairie farm in Manitoba or the Territories, to one that has to be cleared of trees before it can be ploughed. Coming south of the Height of Land to the sources of the Ottawa River, we find large areas of fertile land, and in the valley of the Blanche River there are estimated to be nearly 400,000 acres of clay land, suitable for cultivation, in one block. The country stretching from Lake Nipissing to the Lake of the Woods, and extending from the shores of Lakes Superior and Huron to the Height of Land, is known as the Algoma District, and has often been described by superficial observers as a worthless, rocky region, which must always prove an insurmountable barrier between Central Canada and the North-west. That it looks rocky and worthless, whether viewed from a steamship or from a railway car, cannot be denied, and the rocks are certainly there, but throughout this region are numerous little fertile valleys, sheltered from the rough winds by the much abused rocky hills, and watered by swift flowing rivers and pretty lakes. It is claimed that, owing to the protection afforded by the rocky hills and the moderating influence of the shallow lakes, these little valleys have a much milder climate than the lake shore, and that they are well adapted to growing hardy fruits, as well as grain and vegetables. It must be admitted that, these valleys being small, there is not much good land in any one spot, but altogether there are probably millions of acres available for cultivation between Nipissing and Port Arthur. West of that, along the Canadian side of the Rainy River, there are quite extensive tracks of good land. But the wealth of the region is in the rocks rather than in the soil, for there is reason to

believe that it is the richest mineral district this side of the Rocky Mountains. To describe in detail the discoveries of minerals that have been made, and give reasons for supposing that the whole district is enormously rich in minerals, would occupy a whole evening, but, for the benefit of those who wish to know more about Canadian minerals, it may be noted that Mr. H. B. Small, Secretary of the Dominion Department of Agriculture at Ottawa, who is a member of the American Institute of Mining Engineers, and has a wide reputation as a writer on Canadian subjects, is now engaged on a work giving complete information regarding all the mining districts and minerals of Canada, which will be published in New York this year. The iron deposits of Algoma are said to be even richer than those of Northern Michigan, silver has already been taken out in large quantities, gold has been found in many places, copper and nickel abound, and almost every other mineral excepting coal is known to exist there. Around Sudbury, a little to the north-west of Lake Nipissing, are most extensive deposits of the purest nickel. The Canadian Copper Company of Sudbury are mining and smelting it, and their output at the present time is equal to that of all the other nickel mines throughout the world, and it is said that, when the extensions shortly to be undertaken are completed, the output will be ten times that of all the other nickel mines of the world together. The importance of these mines lies in the fact that it has lately been discovered that five per cent. of nickel, added to steel, increases its strength over thirty per cent., while the alloy is practically non-corrodible, does not tarnish or rust, takes a

finer polish, and lasts longer than steel. In view of the fact that not more than 1,400 tons of nickel are produced in the world annually, apart from the output of the Sudbury mines, it seems evident that Canada must monopolize the nickel steel industry. On the east side of Georgian Bay, between French River and Simcoe, are the districts of Parry Sound and Muskoka, which contain some very good farming lands, but large tracts are almost worthless for agricultural purposes, owing to the prevalence of rocks. There are many pretty little lakes in these districts, and as fish and game abound they are much resorted to in the holiday season. So much for what is known as Northern, or New Ontario.

Old Ontario, the country south of a line drawn from a little north of Ottawa City, to the mouth of the Severn River, contains very little land unsuitable for cultivation, although there are some districts in the eastern counties where it would probably pay better to keep the land in timber. The whole of this region was once a great wheat country. Ontario farmers for years grew almost nothing but wheat, and by continual recropping many farms lost the elements necessary to the successful growth of wheat, while remaining well adapted to other crops. Nevertheless, there are still large areas of good wheat land under cultivation, and according to statistics collected by the Bureau of Industry of the Ontario Government, the average yield of wheat, barley and oats per acre is now higher than in any State of the American Union. Ontario barley has a continental reputation, and that grown around the Bay of Quinte and in some other sections of the province is acknowledged to be superior to any grown elsewhere in America, so that it commands

a price of its own in the markets of the United States. But grain growing is largely giving place to dairy farming and fruit growing. There are many fine herds of cattle throughout the province, and there has lately been a most extraordinary development of the cheese industry. Ontario leads the Dominion in cheese making, and in England the superiority of Canadian cheese to the American product is so well recognized that shipments from Canada always command several cents more per pound than those from the United States. The fact that, owing to the freedom of Canadian cattle from disease, they are allowed to enter England alive, while American cattle must be slaughtered on landing, has greatly stimulated stock-raising in Ontario, and thousands of head are shipped by way of Montreal every year. Apples and certain varieties of grapes can be grown anywhere in Old Ontario, but the fruit garden of the province is the south-western peninsula, lying between Lake Erie and Georgian Bay, and bounded on the west by the Detroit River, Lakes St. Clair and Huron. This district rivals the Annapolis Valley of Nova Scotia in the production of apples, and in the southern part of it peaches, pears, plums and the finest varieties of grapes, grow to perfection. Fruit is most extensively grown along the lake shore between Hamilton and Niagara, where there are thousands of acres of peach orchards. So warm is the climate there, that almonds have ripened in the open air at Niagara, and the fig has been successfully cultivated with very little protection in winter, and ripens two crops in the year, but of course it would not pay to raise figs and almonds for market. Indian corn is extensively cultivated,

Chinese sugar cane is successfully grown on a number of farms in the southern counties, and at Grimsby Mr. C. W. Wellington has had great success in raising African sugar cane, which he says is one of his best paying crops. Pelee Island on Lake Erie is the most southern point in Canada, and strange to say it has a milder climate than the part of Ohio lying directly south of it. This is attributed to the shallowness of Lake Erie waters which surround it. The island is noted for its vineyards, and it is said that cotton has been successfully grown there, but I have been unable to verify this. On the mainland Essex and Kent counties, lying between Lakes St. Clair and Erie, are particularly suited to the culture of grapes and peaches, and the apricot, quince and nectarine do well.

The mineral products of the peninsula are gypsum, salt and petroleum. Gypsum is mined in large quantities along the Grand River ; salt underlies an area of about 1,200 square miles of the counties bordering on Lake Huron, having an aggregate thickness of over 120 feet, but being separated into six successive beds by thin layers of rock. In Lambton and Kent counties, along Lake St. Clair, are the Ontario oil wells which were great gushers thirty years ago, and still yield millions of gallons of petroleum annually. The richest mineral district in Old Ontario lies back of Kingston and Belleville, extending towards the mines of Ottawa county, Quebec, in one direction, and towards Lake Nipissing in the other. Within this district, which may be regarded as a southern extension of the great mineral region of Northern Ontario, are found gold, mica, lead,

plumbago, phosphates, limestone and many thick beds of iron of superior quality.

Although Montreal is the ocean port of Ontario, Toronto is the hub of the province, of which it is the capital. Here are the chief law courts of the province, the Provincial University and a number of denominational colleges. Railways branch out from it in every direction. Its geographical position is not so good as that of Montreal, but every one of its citizens believes that it will be the chief city of the Dominion before the close of



TORONTO UNIVERSITY.

the century.. However this may be, it is growing in a most extraordinary way. In 1871 its population was 56,092; in 1881 it was 86,415; in December 1888, according to a special civic census, it was 172,000, and, as there are over 66,000 different names in the new city directory for 1890, there must now be at least 200,000 people in the city. At this rate of growth, it will not be many years before it ranks among the great cities of the world. There is never likely to be a very great city in the



western peninsula, because there are so many small cities which divide the trade between them. Of these the most important is Hamilton, a prosperous manufacturing town of nearly 50,000 inhabitants, situated in a pretty valley at the head of Lake Ontario, with a mountain at its back and a beautiful bay in front. This town has more manufactures in proportion to population than any other city in Canada. Kingston, at the east end of Lake Ontario, is not unlikely to become in future a great iron-making town, but it may have to compete for this industry with Ottawa, the capital of the Dominion, which is close to the most extensive iron deposits in Quebec, and within easy reach of those in Eastern Ontario, while it is nearer to the nickel mines of Sudbury. Ottawa, being situated by the Chaudière Falls of the Ottawa River, has one of the finest water powers in America. Its population last year was 40,000, as compared with 25,600 in 1881, an increase of 53 per cent. in eight years.

To reach the Canadian North-west from Montreal by the most direct route, one must take the main line of the Canadian Pacific, passing up the Ottawa Valley and striking north of Lake Superior to Port Arthur, on Thunder Bay, and thence to Winnipeg, but if it is desired to pass through Toronto, that city can be reached by either the Ontario and Quebec branch of the Canadian Pacific Railway, or by the Grand Trunk. From Toronto, a railway runs north connecting with the main line of the Canadian Pacific at Callander. From Sudbury the Canadian Pacific sends out a branch line to Sault St. Marie, where it connects with lines running to Duluth and St. Paul. In summer the monotony of an all rail

trip across the continent may be broken by taking passage on one of the magnificent steamships which the Canadian Pacific Railway runs between Owen Sound on Georgian Bay and Port Arthur. The distance from Owen Sound to Port Arthur is 520 miles, and the trip is made in 36 hours. By taking this route the traveller obtains many fine views of the savage scenery along the



PARLIAMENT BUILDINGS, OTTAWA.

north shore of Lake Superior, but nothing on the way equals in grandeur the approach to Port Arthur through Thunder Bay, with Thunder Cape towering over 1,300 feet above the lake on one side, and Pie Island rising nearly 900 feet on the other, while McKay mountain stands in the background beside the Kaministiquia River. Along the shore of Thunder Bay between the Current

and Kaministiquia rivers will grow up one of the great cities of Canada, including within its boundaries the rival towns of Port Arthur and Fort William. Already there are fine docks and the largest elevators in the world. Port Arthur, which is distant from Montreal 993 miles by rail, and 1,270 by water, is located in the centre of one of the richest silver fields in America, and in the vicinity are also found gold, lead, copper, and thick beds of iron ore associated with limestone, suitable for flux, while it will always be the chief distributing point for the vast mineral district of western Algoma, the riches of which have scarcely yet been touched ; but its importance will be chiefly due to the fact, that being the nearest lake port to Manitoba and the Canadian North-west, it will be the outlet of what is destined to be the greatest wheat producing region in the world. To get into this wheat region, one must travel to Winnipeg, 430 miles by the Canadian Pacific Railway through a rough country, which looks almost worthless from the car windows, but contains some areas of good land and minerals of considerable value, while the water powers at Rat Portage, Keewatin and other places are scarcely surpassed anywhere, and are already being utilized to run immense flour mills, one of which has a capacity of 800 barrels per day.

Port Arthur is not likely to be always entirely dependent upon the railway for transportation to Winnipeg, for an almost continuous waterway extends between the two cities and can easily be improved. The Kaministiquia River, which flows out of Dog Lake into Thunder Bay, and its tributary, the Mattawin, which comes from Lake Shebandowan, are both navigable, but on the Kaministiquia, about fifteen miles above

Fort William, occurs the wonderful Kakabeka waterfall, where an American syndicate have laid out a town plot and propose to establish flour mills rivalling those of Minneapolis. This waterfall can be avoided by a short canal or a boat railway, and then there will be continuous navigation between Port Arthur and Lake Shebandowan, which is 45 miles distant by the Dawson road. Lake Shebandowan is 18 miles long, and a portage of three-quarters of a mile connects it with Lake Kashebowie, 9 miles long. Another portage of one mile takes a boat over the Height of Land to Lac des Milles Lacs, which is  $18\frac{1}{2}$  miles long. From this lake to Rainy Lake there is a continuous chain of lakes and rivers, but navigation is interrupted at certain points, necessitating portages aggregating  $6\frac{1}{2}$  miles in length, the total distance between the two lakes being about 119 miles, including portages. From the head of Rainy Lake to the north-west angle of the Lake of the Woods, a distance of 164 miles, there is uninterrupted navigation for large vessels, except at Fort Francis, near the outlet of Rainy Lake, where a canal 800 feet long, to overcome the Kettle Falls, was cut through the solid rock some years ago, but the construction of the lock gates was deferred, and the work has never been completed. The Winnipeg River connects the Lake of the Woods with Lake Winnipeg. A system of canals, giving continuous navigation between Winnipeg City and Port Arthur to barges of the Erie Canal scale, could easily be constructed along this route, and it would probably be possible to make a waterway for vessels drawing nine feet of water. An alternative route might be secured by connecting the lake reservoirs of the Kaministiquia River with Lac des Milles Lacs,

Lac Seul and the Winnipeg River. No doubt, a ship canal between Lake Winnipeg and Lake Superior by either of these routes would be a very costly undertaking, but in connection with the Ottawa and Georgian Bay ship canal it would contribute in such an extraordinary way to the prosperity of the whole country, that a very large expenditure would be justified, for if vessels drawing nine feet of water could pass from Winnipeg to Montreal without breaking bulk, every bushel of grain produced in the North-west would have an increased value. Even a waterway for barges between Lake Superior and Lake Winnipeg would be of incalculable advantage to the North-west, for with such a system barges could be loaded all along the Saskatchewan, Red, and tributary rivers, transferring their cargoes to lake vessels at Port Arthur.

The country now known as the Canadian North-west extends from the western boundary of Ontario to the Rocky Mountains of British Columbia, and from the United States boundary to the Arctic Ocean. It has three great river systems, the Nelson and Churchill draining into Hudson Bay, and the Mackenzie draining into the Arctic Ocean. Besides the rivers included in these three systems, there are several important rivers flowing into Hudson Bay and the Arctic Ocean. The great reservoirs of the Nelson system are Lakes Winnipeg, Winnipegosis and Manitoba, which receive the outflow from the Lake of the Woods through Winnipeg River, as well as the waters flowing from the prairies through the channels of the Saskatchewan, Red and Assiniboine rivers and their affluents. The length of Lake Winnipeg is 300 miles, and that of Lakes Manitoba

and Winnipegosis 230 miles, while the rivers that flow into them from the Western prairies are navigable in the aggregate for 3,000 miles. There are a few boulders in these rivers, which can easily be removed, and at the mouth of the Saskatchewan a waterfall occurs, around which a short canal must be constructed. The Nelson River, which is the outlet of the system, is a large river, but at present is only navigable for fifty miles from its mouth, on account of rapids. The Hayes River, rising in a small lake south of Lake Winnipeg, has been much used by the Hudson Bay Company in transporting goods from Hudson Bay to Lake Winnipeg, connections being made by portages. The Nelson and Hayes rivers form estuaries at Port Nelson, and York Factory is located on a tongue of land between them. The estuary of the Nelson River is described by Commander Gordon as one of the most dangerous places in the world. There is no harbor, and he says it could not be made a desirable place for shipping by the expenditure of any amount of money. The Churchill River has for its reservoirs a host of small lakes between Lake Winnipeg and Lake Athabasca, including among others Isle la Crosse, Beaver, Reindeer, Wollaston and Indian. Port Churchill, at the mouth of the river, has the finest harbor in Hudson Bay, and the river is navigable for large vessels for many miles. The Mackenzie is almost as grand a system of lakes and rivers as the St. Lawrence. Its first reservoir is the Lesser Slave Lake, out of which flows the Lesser Slave River, emptying into Athabasca River, which discharges into Lake Athabasca. The Great Slave River connects Lake Athabasca with Great Slave Lake, out of which flows the Mackenzie

proper to the Arctic Ocean, being joined at Fort Simpson by the Liard River from British Columbia, and receiving still farther north the outflow from Great Bear Lake. The Mackenzie proper is 1,037 miles long, with an average width of one mile and a quarter, and there appear to be no obstructions to navigation throughout its course. Extending the name to the system of rivers of which it is the outlet, the Mackenzie is navigable for 1,360 miles for light-draught sea-going vessels, and without including the lakes there are 2,750 miles of navigation, suitable for stern wheel steamers which, with their barges, can carry 300 tons.

If the lakes be included, the Mackenzie system gives a total of about 6,500 miles of continuous lake coast and river navigation, broken only in two places by rapids which can easily be overcome by canals or tramways. One of these breaks is on the Great Slave River above Fort Smith, where navigation is obstructed by rapids, for about thirteen miles, while the other is on the Athabasca River, where there is one grand rapid extending for two miles, and several smaller ones, making navigation difficult but not impossible for over sixty miles; but the removal of a few boulders would probably make navigation safe except at the Grand Rapids, where a canal or boat railway would have to be constructed. The chief tributary of the Mackenzie is the Peace River, which, rising in the mountains of British Columbia, makes connection with the lower end of Lake Athabasca by means of the Quatre Fourches River, but empties into Great Slave River by another mouth, twenty-five miles below. In the spring, when the Peace River is high, the water runs out of the Quatre Fourches River into the



lake; in the summer, the water runs out of the lake into the river. From its mouth to the Rocky Mountains, a distance of 740 miles, steamboat navigation on the Peace River is only interrupted by rapids or waterfalls in two places, having an aggregate length of  $5\frac{1}{4}$  miles, which can easily be avoided by canals.

A wagon road 90 miles in length, from Athabasca Landing to Edmonton, connects the Mackenzie system with navigable water on the Saskatchewan, 813 miles from Lake Winnipeg, and it would not be a very costly undertaking to connect the Mackenzie and Nelson systems of navigation by a boat railway, capable of carrying small vessels across the portage in a few hours. The west end of Lesser Slave Lake is connected with Peace River, at its confluence with Smoky River, by a cart road 55 miles in length, and a canal or a boat railway along this route would save hundreds of miles of voyaging in going from Athabasca Landing to the Peace River district. Lake Athabasca could probably be connected with the Churchill system by canals, although the cost of such an undertaking would, no doubt, be great, and it is likely that a larger class of vessels could reach the Mackenzie from Hudson Bay by the Churchill route than by the Saskatchewan. However, it is difficult to obtain reliable information regarding the Lake country between the Churchill proper and Lake Athabasca.

When Champlain first reached the upper end of Montreal Island and saw the Ottawa River he exclaimed: "La Chine! This is the way to China!" That is why we call our Montreal Canal Lachine. The name will be justified when the St. Lawrence, Nelson and Mackenzie systems of navigation are connected, for then a small

steamer leaving Montreal harbor will pass through the Lachine Canal, up the Ottawa to Georgian Bay and by way of Port Arthur, Lake Winnipeg and the Saskatchewan to the Mackenzie, which it will navigate to the Arctic Ocean, where a larger steamer will be waiting to take the passengers through Bering Strait and across the Pacific to China. However that voyage will only be made occasionally by adventurers. The real utility of the Mackenzie connection with the Arctic will be to enable whalers, sealers and other fishermen to prosecute their business in the Arctic Ocean without taking the long and dangerous voyages which are now necessary. Vessels will be built and fitted out for Arctic fishing at some point on the Mackenzie River where timber is plentiful. They will winter in the Mackenzie River, and during the season of navigation will transfer their cargoes to small steamboats or barges at the head of ocean navigation on the Mackenzie, whence they will be sent down to Edmonton, Winnipeg, Port Arthur, Toronto and Montreal for distribution. And now as to the navigation of Hudson Bay. The navigation of the bay itself is an easy matter. The question is how to get out of the bay. Hudson Strait to the far north is blocked with ice for eight or nine months of the year, and even during the short season of navigation vessels are liable to be delayed by fields of floating ice. Rapid tidal currents often entangle vessels in running ice, and the difficulties of navigation are increased by the proximity of the magnetic pole, which makes the compass almost useless. The distance from Port Churchill to Liverpool by this route is only 2,900 miles, that is, about 100 miles shorter than from New York to Liverpool,

but the delays practically make the distance much greater. It is true the Hudson Bay Company have brought their supplies from Europe to the North-west through Hudson Strait for over a century, but it is not likely that this far northern route will ever become a commercial highway. But looking to the South instead of the North for an outlet, a vessel can pass down the ship channel of James Bay to Moose Factory, and from this point the great Abittibe River leads up to the Height of Land. No definite information is obtainable regarding the navigation of the river Abittibe, but probably some improvements would be necessary to enable vessels to reach Lake Abittibe, and a system of canals making connection with the Lower Ottawa would no doubt be very costly, but if navigation for vessels drawing nine feet of water could be secured between Port Churchill and Montreal for six months of the year, it would be of greater value to the North-west than difficult navigation of Hudson Strait for three months of the year. Of course this route to Europe would be longer than the northern one, but it would have the advantage of being on the way to the great manufacturing cities of Eastern Canada and the United States. Even if Hudson Bay had no outlet, this great inland sea would be of value to the North-west on account of its whale, seal and other fisheries. The fishing vessels coming down to Moose Factory from the North could transfer their cargoes to railways for shipment to Montreal.

The Canadian North-west embraces a prairie, a woodland and a barren region. The prairie region, which is drained by the Nelson system of rivers, lies between the international boundary and the 54th parallel of latitude,

being divided into three steppes, which slope gradually from the Rocky Mountains eastward toward the Red River and Lake Winnipeg. The lowest of these steppes is the Red River Valley with an average height of 800 feet, a width of 52 miles at the international boundary, and a total area of 55,000 square miles, of which nearly 14,000 square miles are covered with lakes. The second steppe has an average elevation of 1,600 feet above sea level, is about 250 miles wide at the 49th parallel, and has a total area of about 100,000 square miles. The third steppe has an average elevation of 3,000 feet, being 4,000 feet high at the foot-hills and 2,000 feet at its eastern edge, with a width of 465 miles at the international boundary, and a total area of 134,000 square miles.

Throughout the greater part of the prairie region there are clumps of trees here and there, and these are most numerous along the northern border of the plains. The woodland region lies within the basin of the Churchill and Mackenzie river systems, while the barren lands are north of the Churchill and east of the Mackenzie. While the slope of the plains is from the mountains eastward, the whole country slopes northward toward the Arctic Ocean, and this northward slope is so proportioned to the increasing latitude as to almost completely counteract the influence of the latter upon the climate, for hundreds of miles north of the international boundary. Besides the Province of Manitoba the Canadian North-west includes the district of Keewatin, extending along the western shore of Hudson Bay, the territories of Assiniboia and Saskatchewan, lying west and north-west of Manitoba, Alberta Territory west of Assiniboia and Saskatchewan, Atha-

basca Territory north of Alberta, and an unorganized territory without name, part of which lies west of the Mackenzie River and north of Athabasca, while the remainder lies between Keewatin and the Mackenzie River, and extends from the Churchill River to the Arctic Ocean. A great portion of this unorganized territory and the part of Keewatin north of the Churchill River seem to be unfit for human habitation, but this district is not utterly worthless, for its climate is most favorable to fur-bearing animals, the waters teem with fish, and the land is said to be underlaid with valuable minerals, so that in the distant future it may prove a source of considerable revenue to the Dominion. The southern part of Keewatin is not a wheat growing district, but oats, peas, barley and all kinds of vegetables are raised, and grasses grow with great luxuriance. But the real farming region of the Canadian North-west is in Manitoba and the organized territories west of it, the soil and climate being specially adapted to the production of enormous crops of grain and vegetables. Professor Macoun, the eminent botanist, who has made a most careful study of the climate and soil of the whole Canadian North-west, estimates that, after deducting lakes, rivers, swamps and bad lands, there are at least 150,000,000 acres of land suitable for growing the very finest grades of wheat. From forty to fifty bushels of wheat to the acre is a common yield, but the average is reduced by occasional losses from summer frosts and other causes. Extraordinary crops of vegetables are grown, and chicory is now being cultivated on an extensive scale by a Franco-Dutch company. It is said to be superior to any produced in Europe, and the yield last

year was 250 bushels per acre. The climate does not appear to be suitable for fruit growing, but the Government farms are experimenting with hardy varieties of apples from Northern Europe, and may succeed in introducing them. The climate of Manitoba is somewhat milder than that of Northern Dakota, the higher latitude of the former being more than offset by its lower elevation and its large lakes. Manitoba is less subject to blizzards, and in common with all Canada is entirely free from destructive cyclones. At Winnipeg the minimum temperatures for the seven years from 1882 to 1888, averaged in January and February—42.5°; March—30.6°; April—5.6°; May 24.6°; June 35.9°; July and August 37.8°; September 25.7°; October 12.4°; November—16.2°; December—37.7°. The average of all temperatures for seven years was in January and February—7.7°; March 10.3°; April 35.9°; May 51°; June 62.7°; July and August 63.6°; September 38.7°; October 19.9°; December 1.8°. The maximum temperatures during seven years averaged for April 65.9°; May 79°; June 86.6°; July and August 89.8°; September 78.3°; October 70.9°. The atmosphere in winter is dry, clear and full of ozone, while there is seldom any wind, so that the cold does not penetrate the body as does that of moist climates where the thermometer never registers below zero; but the ears must be kept covered and the nose frequently rubbed, for exposed parts of the person freeze very quickly.

As we move west from Manitoba the climate grows milder, and the area of habitable territory widens and extends nearer to the North Pole. In Alberta the thermometer sometimes registers nearly as low as in Mani-

toba, but the average winter temperature is much higher, for the cold never lasts long, being dispelled by Chinook breezes. At Calgary, Alberta, the minimum temperatures for the seven years from 1882 to 1888, averaged in January and February—36.8°; March—12.3°; April 10.6°; May 21.8°; June 30.7°; July and August 32.2°; September 25.8°; October 5.8°; November—13.3°; December—20.5°. The average of all temperatures for seven years was in January and February 10.3°; March 27.7°; April 39.9°; May 49°; June 56°; July and August 58.8°; September 49.2°; October 39.2°; November 27.9°; December 15.3°. The maximum temperatures averaged in April 70.7°; May 80.2°; June 87.5°; July and August 88.7°; September 81.5°; October 76°. In the Mackenzie River district wheat is grown successfully on the 60th parallel of latitude; barley, rye and oats can be grown farther North, and potatoes are raised within the Arctic Circle. In 1888 a committee of the Dominion Senate, after examining many witnesses, including farmers, hunters, traders, missionaries and scientists, reported that north of the Nelson River system, and within the basin of the Mackenzie system of rivers, the climate is suitable to the growth of potatoes over an area of 656,000 square miles, to the growth of barley over an area of 407,000 square miles, and to the growth of wheat, over an area of 316,000 square miles. There is estimated to be a pastoral area of 860,000 square miles, 26,000 square miles of which are open prairie with occasional groves, the remainder being more or less wooded, and 274,000 square miles may be considered arable land, while about 400,000 square miles of the total area between the Nelson system and the Arctic



Ocean are useless for the pasturage of domestic animals and for cultivation. Throughout the arable and pastoral area, latitude bears no direct relation to summer isotherms, the spring flowers and the buds of deciduous trees appearing as early north of Great Slave Lake as at Winnipeg or St. Paul, and earlier along the Peace and Liard rivers and some of the minor affluents of the great Mackenzie River. Professor Macoun says that spring advances from north-west to south-west at the rate of about 250 miles per day, and that winter begins in Manitoba and goes westward at the same rate. Many reasons are assigned for the warm summers in the far North-west. The elevation of the country is thousands of feet lower than at the American boundary, the Rocky Mountains are also lower, and there are many passes in them through which come warm Chinook breezes from the Pacific, while the numerous lakes in the district favorably affect the temperature, and in the summer there is almost no night there. An American writer has called all Canada "Daylight Land" because of our long summer days. The title is not at all appropriate as regards South-eastern Canada; it seems apt when we reach the prairies of Manitoba, but one must live in the valley of the Peace River from the middle of April until the middle of September to realize that Canada is indeed the land of daylight. Of course long summer days are offset by long nights at mid-winter, and during the season of darkness some very cold weather is experienced. At Fort Dunvegan, in latitude 56° North, the minimum temperatures for the seven years averaged in January and February—56.9°; March—31.4°; April—6.3°; May 22.3°; June 27.8°; July and August

31.7°; September 22.7°; October 12.9°; November—14.6°; December—41.5°. The average of all temperatures for seven years was in January and February 4 8°; March 15.2°; April 34.2°; May 50.1°; June 56°; July and August 58.9°; September 45.7°; October 31.6°; November 16.5°; December—9.1°. The maximum temperatures for seven years averaged for April 67.2°; May 80°; June 82.3°; July and August 87.5°; September 74.5°; October 61°. At Fort Liard, in latitude 60° North, the climate is said to be better than at Fort Dunvegan. In addition to the agricultural resources of the Mackenzie Basin, the Senate Committee report the existence of extensive deposits of coal as well as iron, gold and many other valuable minerals, and it is believed to contain the most extensive petroleum field in the world, while the numerous lakes and rivers all swarm with edible fish. The southern part of this district now forms the Territory of Athabasca, and it is likely to become in course of time one of the most populous provinces of Canada. In former days the buffaloes made the Bow River district of Alberta Territory their headquarters, finding there warm Chinook breezes, luxuriant grasses and many streams of crystal water. From this point they ranged in countless millions as far north as the Peace and Liard rivers in Canada, and southward over the plains of the Western States. Now the buffaloes have gone, but in the ranches of the Bow River Valley hundreds of thousands of cattle, horses and sheep stay out all winter without shelter and find food for themselves. The climate of Manitoba and the territories adjoining it is not suitable to ranching, but there are some fine stock farms in those provinces. In Western Manitoba and Assiniboia are found beds of lignite

which improves as we go westward, becoming semi-bituminous coal at Lethbridge in Alberta, where the Galt mines are located, bituminous coal of good quality at Mitford and Canmore, twenty-five miles west of Calgary, and anthracite equal to the best produced in Pennsylvania at Anthracite, five miles east of Banff, on the borders of British Columbia. Iron and many other minerals are found in the mountains close at hand, so that a great iron-making town will no doubt grow up somewhere in this district. The coal of Alberta is estimated to cover an area of 40,000 square miles, and this is believed to be only the southern rim of a great coal field, of which Edmonton in Saskatchewan Territory is supposed to be the centre.

Where the chief city of the Canadian North-west will be is as yet a matter of conjecture. Winnipeg, the capital of Manitoba, is at present the metropolis, and it may keep the lead, although many people predict that the great city will be farther west. It is already a railway centre of some importance, and is almost certain to eventually become a large city. Other towns of promise along the line of the Canadian Pacific Railway are Brandon and Portage la Prairie in Manitoba, Regina and Medicine Hat in Assiniboia, Calgary and Canmore in Alberta, while Edmonton and Battleford in Saskatchewan are waiting for another transcontinental railway. A prosperous town may grow up at Banff, close to the Canadian National Park with its grand mountain scenery, pretty lakes, beautiful walks and drives, and famous medicinal hot springs.

The Province of British Columbia is the wonderland of Canada. Within its boundaries are reproduced all

the varied climates of the Dominion and almost every natural feature, while there are some local varieties of climate and landscape that cannot be found elsewhere. Its lofty snow-capped mountains, lovely valleys, pretty lakes, and much indented coast, combine to make it the most beautiful section of Canada, and there is reason to believe that its natural resources are greater than those of any other province. Extending from the Canadian North-west territories to the Pacific Ocean and from the United States boundary to the sixtieth parallel of latitude, with Alaska at the North-west and the unorganized North-west territory of Canada at the north-east, it has an area of over 390,000 square miles. The Olympian mountains rise out of the ocean in Vancouver and Queen Charlotte Islands, while on the mainland there are the Rockies, the Gold and the Coast Ranges with long plateaus between them. The Gold Range is a broken mass of mountains, known in different parts of its length as the Purcell, Selkirk, Columbia, Cariboo, Omenica and Cassiar mountains, but the name Gold Range is sometimes especially applied to the Columbia mountains. The mountains of the interior gradually slope northward and trend to the west, finally becoming merged in the Coast Range. The highest peaks are near the head waters of the Bow, North Saskatchewan and Athabasca rivers, culminating in Mount Brown with a reputed elevation of 16,000 feet.

British Columbia has often been called a "sea of mountains," sometimes in patriotic admiration, sometimes in contempt. Speaking of a "sea of mountains" in "The Land of Waterways," the thought naturally arises, can this sea be navigated? The valleys between

the mountains have been called the troughs of the sea, and through these valleys flow many large rivers with numerous lake reservoirs, fed by streams from the mountains. There are many stretches of navigation, some of them hundreds of miles in length, but at certain points continuous navigation is interrupted by rapid descents and narrow cañons, through which the rivers rush.

The lakes are all long, narrow and deep, while the principal rivers are noted for their peculiar bends. The best illustration of this peculiarity is found in the Kootenay and Columbia rivers which run around the part of the Gold Range known as the Selkirks. The Upper Kootenay River, coming down from the Rocky Mountains, reaches the valley and becomes navigable just one mile away from the Upper Columbia Lake. The level of the Columbia Lake is ten feet lower than that of the Kootenay River, and the watershed between them is a level, gravel flat, having a gradual slope to the lake. Under such circumstances the river might be expected to flow into the lake, but instead of doing so it turns south, runs down through the valley between the Rockies and the Selkirks, crosses the international boundary, bends around the mountains, turns north again and, re-entering Canada, flows up the lower Kootenay Valley between two arms of the Selkirks, and terminates in a beautiful lake, ninety miles in length. The elevation of the Lower Kootenay Valley is only 1,750 feet above the sea, being about 600 feet lower than the Upper Valley, and directly opposite the point, where the Kootenay River should have joined the Columbia in the first place, it flows out of Kootenay Lake through a narrow

gorge twenty-five miles in length, and enters a third valley 800 feet lower down, there joining the Columbia, which has reached the same place after making a long northward bend around the Selkirk Mountains. The united rivers then cross the international boundary, and flow to the Pacific through American territory. In summer the Kootenay River is navigable for small steamers throughout its course in the valleys, except at its south-eastern bend in the United States, where there is a one-mile portage to overcome rapids. From Bonner's Ferry, about ten or twelve miles south of the international boundary, to Kootenay Lake, a distance of eighty miles, the river is from six hundred to seven hundred feet wide, with an average depth of forty-five feet, and there is not a place in it where the largest ocean vessels would not float with ease.

The great bend of the Columbia is made unnavigable by cañons, but steamers run from Golden City on the Canadian Pacific Railway to the lower Columbia Lake, and the Dominion Government is about to make improvements in the channel between the two lakes, which will enable steamers to reach the head of Upper Columbia Lake. From this point to the Kootenay River a canal is now being constructed across the low watershed already described, which will ensure continuous navigation for 250 miles, and if the American Government would construct a canal one mile in length at the southern bend of the Kootenay, there would be continuous navigation for steamers from Golden City to the Kootenay Lakes, a distance of over 400 miles. In the Lower Columbia Valley, the Columbia with its Arrow Lake expansions is navigable for many miles.

The Fraser River, rising farther north in the same plateau as the Columbia, bends around the Cariboo Mountains and flows down to the Pacific between the Gold and Coast ranges. It is now navigable as far as New Westminster, fifteen miles from its mouth, by large ocean vessels, and river steamers ascend as far as Yale, 110 miles from the mouth. Above Yale there are several stretches of navigation, separated from each other by narrow cañons, enclosed between precipitous mountains, through which the river rushes in foaming torrents. At God's Lock Gate the river contracts to a width of ten feet, and of course the current is of extraordinary force. There does not appear to be room between the mountains to construct canals around these torrents, and it is altogether improbable that continuous navigation can ever be secured. However, Mr. D. W. Pearse and Mr. G. B. Wright, engineers employed by the Dominion Department of Public Works, after a careful survey estimate that in many of these cañons obstructions can be removed which will widen the channel, and that by an expenditure of \$200,000 navigation for steamers can be secured from a point 110 miles above Yale to Cottonwood Cañon, a distance of 210 miles. The principal tributary of the Fraser River is the Thompson, which, with its lake reservoirs Kamloops and Shuswap, is navigable for many miles.

The Parsnip River, the upper branch of the Peace River, rises near the bend of the Fraser, and there is only a short portage between them. Boats carrying five or six tons have been taken all the way up the Fraser, carried across the portage, and floated down to the Peace River and up its tributary River Omenica. The Parsnip



and Peace rivers, although rapid streams in the mountains, are said to be navigable for stern wheel steamers, for several hundred miles before the descent to the plains is made in a series of rapids extending for about eighty miles, the total fall being about one thousand feet, after which the river flows slowly for 740 miles to the Mackenzie, as already described.

There are many navigable rivers in the north, including the Skeena and Stickeen rivers, which empty into the Pacific, and a number of long ones which are tributary to the Yukon River.

As the mountains extend along the coast, the various inlets may be included in the mountain navigation. The coast navigation may best be described in the words of Lord Dufferin, who said: "Such a spectacle as its coast line presents is not to be paralleled by any country in the world. Day after day for a whole week in a vessel of nearly 2,000 tons, we threaded an interminable labyrinth of watery lanes and reaches, that wound endlessly in and out of a network of islands, promontories, and peninsulas for thousands of miles, unruffled by the slightest swell from the adjoining ocean, and presenting at every turn an ever shifting combination of rock, verdure, forest, glacier and snow-capped mountain, of unrivalled grandeur and beauty. When it is remembered that this wonderful system of navigation, equally well adapted to the largest line-of-battle ship and the frailest canoe, fringes the entire sea-board of the Province, and communicates, at points sometimes more than a hundred miles from the coast, with a multitude of valleys stretching eastward into the interior, while at the same time it is furnished with innumerable harbors on either hand,

one is lost in admiration at the facilities for intercommunication, which are thus provided for the future inhabitants of this wonderful region."

So we may truthfully say that Canada's "sea of mountains" is navigable, but nevertheless navigation is of such a local character that the Province was entirely isolated from the rest of the Dominion until the Canadian Pacific Railway went through. For many years the Canadian Rockies were considered impassable, but eleven passes have now been discovered and explored, the highest being the South Kootenay, with an elevation of 7,100 feet at the international boundary, and the lowest the Peace River Pass, with an altitude of 2,000 ft., in latitude 56 degrees North. The pass first selected by the Government for the Canadian Pacific Railway was the Yellowhead, where the altitude is 3,733 feet, and the maximum grades would be only one per cent., but in order to reach this pass the line of the railway would have to be deflected very far north from Medicine Hat, and it was finally decided to adopt the Bow River, or Kicking Horse Pass, where the altitude is 5,300 feet, and the maximum grades 116 feet per mile. There are two stretches of the road at present where the grade is four and one-half per cent., but these sections are only temporary, the permanent line along the face of Mount Stephen, with maximum grades of two and a half per cent., being very difficult of construction. The length of the railway from the eastern slope of the Rockies to the Pacific coast is 522 miles, and all the gradients exceeding one per cent. are upon the 134 miles between the head waters of the Bow River in the Rockies, and a point near Albert cañon of the Illecillewaet River in the Selkirks.

Climbing the mountains of British Columbia it is easy to understand how the low elevation of the Canadian North-west gives it a milder climate than the adjoining States and Territories, for above an elevation of 6,000 feet in this latitude snow falls during every month of the year, so that the higher peaks are always capped with snow, and magnificent glaciers can be seen at various points along the line of the Canadian Pacific Railway, those of Mount Stephen and Mount Sir Donald being particularly grand. In this elevated section of the Canadian Pacific Railway there are six miles of snow-sheds, not continuous of course, but situated where required for protection, and another mile of them will have to be constructed. This is the only part of the railway where much trouble is experienced with snow, and having such a short distance to protect, as compared with the highly elevated American lines, the Canadian Pacific Company can afford to expend a great deal of money on strong snow-sheds and other contrivances for preventing blockades, so that the line is kept open and the trains run on good time, when the American trans-continental railways are blocked with snow for hundreds of miles. However, to guard against possible blockades, nine provision magazines have been located about ten miles apart along the elevated section, so that in case of delay there will always be ample supplies of food for passengers and train hands. There are also store-houses for coal, oil, etc., and the various materials required for repairing tracks and bridges. After the Canadian Pacific line was constructed, it was discovered that the Crow's Nest pass of the Rockies, almost directly in line with both Medicine Hat and Vancouver

City, is only 4,830 feet high ; the grades are said to be easier all along the route, and as it is much more direct than the line adopted, there is very little doubt that the Canadian Pacific Company will eventually send a branch through the Crow's Nest, passing down the fertile valleys of the Kootenay and Columbia rivers to Vancouver City, and shortening the distance between the two oceans by about 200 miles.

Every square mile of British Columbia may be said to have its own climate, and it would be impossible to give a general description that would apply to the whole province. The climate is very mild along the coast, the most northern districts having a temperature similar to that of Scotland, while the southern coast climate probably more nearly resembles that of the south-western counties of England than any other part of America. At New Westminster, at the mouth of the Fraser, according to the meteorological records for the seven years from 1882 to 1888 inclusive, the lowest temperature in January of an average winter is  $17.4^{\circ}$  ; in March  $27.6^{\circ}$  ; April  $31.3^{\circ}$  ; June  $44.9^{\circ}$  ; July and August  $45.7^{\circ}$  ; September  $41.2^{\circ}$  ; October  $29.8^{\circ}$  ; November  $25.2^{\circ}$  ; December  $18.6^{\circ}$ . The average of all temperatures in January and February is  $35.3^{\circ}$  ; March  $40^{\circ}$  ; April  $48.2^{\circ}$  ; May  $54.3^{\circ}$  ; June  $58.3^{\circ}$  ; July and August  $62^{\circ}$  ; September  $56^{\circ}$  ; October  $48.1^{\circ}$  ; November  $40.5^{\circ}$  ; December  $34.5^{\circ}$ . The maximum temperature was  $70^{\circ}$  in April ;  $78.3^{\circ}$  in May ;  $81.2^{\circ}$  in June ;  $85.7^{\circ}$  in July and August ;  $78.1^{\circ}$  in September ;  $67.2^{\circ}$  in October and  $54.4^{\circ}$  in November. Observations for seven consecutive years show that the rainfall in January, including snow reduced to water, averages 8.16 inches ; February

7.1 inches; March 6.27 inches; April 2.92 inches; May 3.49 inches; June 2.32 inches; July 1.78 inches; August 1.96 inches; September 3.44 inches; October 5.7 inches; November 6.95 inches; December 9.48 inches, making a total annual precipitation of nearly 60 inches, including snow, which seldom falls. This may be taken as a fair sample of the climate of the part of the mainland coast in the vicinity of Vancouver Island. The south-eastern portion of Vancouver Island has about the same temperatures, but the rainfall is considerably less, while along the western coast of Vancouver Island and all along the northern mainland coast the rainfall is much greater.

The plateau between the Gold and Coast Ranges has about the same mean annual temperature as the coast in the same latitude, but the extremes of heat and cold are greater, while the climate is very dry. In the higher plateau between the Gold Range and the Rockies the climate is colder, approximating to that on the eastern slope of the Rockies. In some parts of this plateau rain falls almost continually in summer, and the snow fall in winter is very heavy, while in other sections of the same plateau it is comparatively dry. For example, the upper valley of the Columbia near the bend has a very great rainfall, but in the vicinity of the Columbia lakes the rainfall decreases, and the upper Kootenay Valley in the same plateau has a dry climate. Owing to the mountainous character of the country the area of agricultural land is small in proportion to the size of the province, but there are estimated to be at least seven million acres of arable land, while the area suitable for pasturage is immense. Where the land can be

cultivated it is very rich, and the climate is so varied that every fruit, vegetable, plant and flower known to the temperate zone can be produced to perfection. The greatest obstacle to the cultivation of the soil and development of the agricultural wealth of the province is the immense size of the trees, which makes the clearing of wild land too costly an undertaking for the ordinary farmer. Except on the mountain peaks, the whole province is covered with timber. There are 30 species of trees, and some of them grow to an extraordinary size. The Douglas fir frequently grows to a height of 300 feet, having a diameter of from eight to nine feet, while some of the cedars have a diameter of 17 feet.

Almost every known mineral has been discovered in British Columbia and the colors of gold have been found in all the rivers and streams from the international boundary to Alaska. As yet there has been almost no quartz mining, but the placer miners have taken out of the rivers and streams over fifty million dollars worth of gold. When quartz mining is begun on an extensive scale, the yield of gold will probably be enormous. Silver, copper and lead are found in large quantities in various sections, while iron and coal are very widely distributed both on the mainland and the islands. The anthracite of Queen Charlotte Islands compares favorably with that of Pennsylvania, and according to tests made by the United States War Department, the bituminous coal of Vancouver Island is far superior to any coal on or near the Pacific coast, south of the international boundary. The most important deposits of iron yet known in British Columbia are those of Texada Island, between Vancouver Island and

the mainland. It is magnetite of superior quality, associated with limestone suitable for flux, contiguous to good harbors and close to the great coal beds of Vancouver Island. Texada Island is one of a group lying between Vancouver Island and the mainland. The channels between the islands and the mainland are not too wide to be bridged, and a railway will no doubt pass over to Vancouver Island this way in the course of time.

The wealth of British Columbia's fisheries cannot be estimated. Salmon swarm along the coast and ascend the rivers in myriads, climbing over rapids and waterfalls, and swimming through the torrents of the cañons, to be caught 600 miles in the interior. Black cod, herrings, halibut, sardines, smelts and oolachan abound along the coast, oysters thrive, and the seal fisheries of Bering Sea are accessible, while in the interior of the province sturgeon, trout, pike, perch and white fish, as well as salmon, are numerous in the rivers and lakes.

The farms, the forests, the mines and the fisheries of British Columbia will give employment to millions, but the chief industry of the province must eventually be manufacturing. With numerous water-powers, unlimited supplies of iron and coal of the best quality, and inexhaustible forests of the finest timber, no country is better suited for iron-making and wood-working industries, while the climate is especially adapted to the manufacture of textiles. It is well known that a moist climate is essential to the successful manufacture of the finest grades of cotton and woollen goods, and every variety of climate, from dry to wet, can be found within a few square miles in the southern part of British



Columbia, so that the manufacturer can select exactly the climate to suit his purpose. Raw cotton can be imported from Australia or India, and wool from New Zealand can be mixed with the wool produced in British Columbia. All kinds of manufactured goods will be sent to Japan, China, Australasia, India and South America, and a large Russian trade may possibly be developed. In fact, the geographical situation of British Columbia is most favorable for trade with all the countries of the Pacific and Indian Oceans. A British manufacturing establishment, with a large trade in the East, by moving the works and workmen from England to the southern coast of British Columbia, would save nearly one thousand miles of carriage in shipping goods to Singapore, between three and four thousand miles in shipments to Hong Kong, over seven thousand miles in shipments to Yokohama, about six thousand miles in shipments to Auckland, New Zealand, and about five thousand miles in shipments to Sydney, Australia, while the distance to Calcutta would be very little greater than from England.

While there are first-class harbors all along the Pacific coast of Canada, and the climate is so mild that none of them are ever blocked with ice at any season of the year, it is generally conceded that those of Burrard Inlet, on the mainland, and Esquimalt, on Vancouver Island, are the best. Burrard Inlet, being most accessible for railway purposes, has been chosen as the Pacific terminus of the Canadian Pacific Railway, and on a peninsula at the mouth of this inlet, with water almost all around it deep enough to float the largest ocean vessels, the terminal city, Vancouver, is being built. The name of the town has

been stolen from the adjoining island, much to the indignation of its inhabitants. In 1884 the land on which Vancouver City stands was a wilderness covered by gigantic forest trees; in 1885 the Canadian Pacific Company selected it as the terminus, but the railway did not reach it until 1887. In 1886, when the town had a population of 2,000, it was completely destroyed by fire, only two or three houses being saved. Now it is a solidly built city, with an estimated population of over 15,000. The founders of the city took precautions to prevent land booming, building conditions being imposed in almost every land transaction, so that its growth has been steady and solid. There is very little doubt that Vancouver will eventually become the greatest city on the Pacific coast of America. Ocean vessels in the harbor of Vancouver are 2,906 miles from ocean vessels in the harbor of Montreal, and the distance from Liverpool to Hong Kong is nearly 1,200 miles shorter by way of Montreal and Vancouver than by way of New York and San Francisco. The distance from Liverpool to Vancouver City *via* St. John, N. B., and the Canadian Pacific Railway, is 6,470 statute miles, and *via* Quebec 6,120 miles, while the distance to San Francisco by the shortest American route is over 6,700 miles. The distance from New York to Vancouver *via* Brockville is 3,162 miles, while the shortest American route from New York to San Francisco is 3,271 miles, and Boston, which is 3,397 miles from San Francisco by the shortest American route, is only 3,222 miles from Vancouver *via* the Canadian Pacific Railway. The sailing distance from Vancouver to Yokohama and Hong Kong varies somewhat according to different estimates, but all of them

concede that the Canadian city has the advantage of San Francisco by several hundred miles. According to a report of the Canadian Minister of Public Works, the distance from Vancouver to Yokohama is 4,362 geographical miles. But it is on the return trip that Vancouver is peculiarly favored. The Japan Current flows swiftly toward the Pacific coast of Canada, practically shortening the distance by hundreds of miles, and even vessels bound for San Francisco save time by going with it toward British Columbia. It might be supposed that ships from Vancouver bound for Japan or China would have this current against them, but in fact it bends northward somewhat after the manner of a British Columbia river, so that the direct sailing course between Vancouver and Japan does not lie in its way. Vancouver is distant from Sydney, Australia, 6,829 miles, from Auckland, New Zealand, 6,934 miles, and from Singapore 7,376 miles.

Victoria, at the south-east of Vancouver Island, is the capital of British Columbia. Its situation is beautiful, and the climate almost perfect, but the harbor is not particularly good. However, Esquimalt harbor, which is equal to those of Burrard Inlet, is only three miles away, and the city will eventually extend to it.

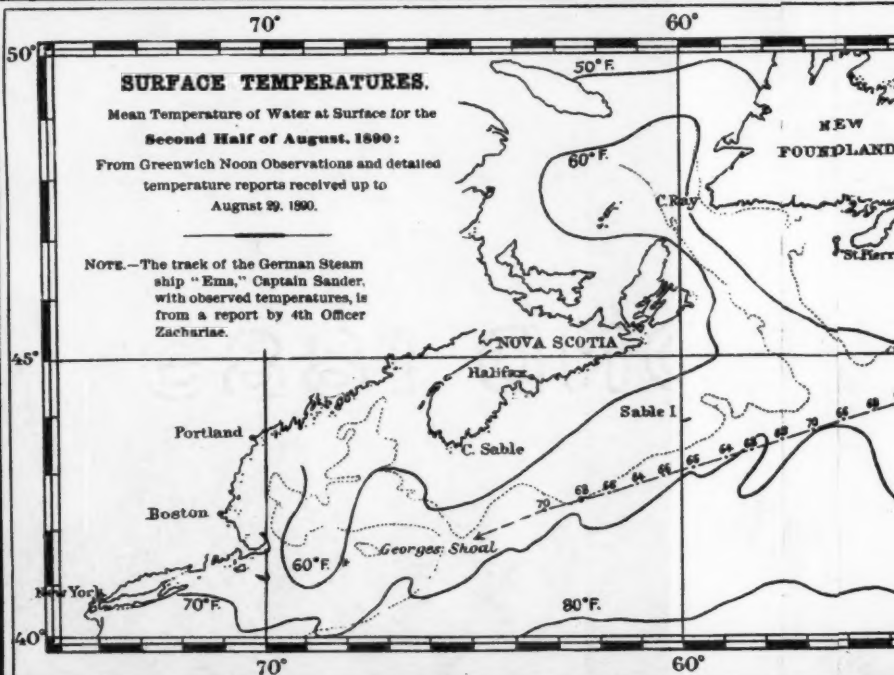
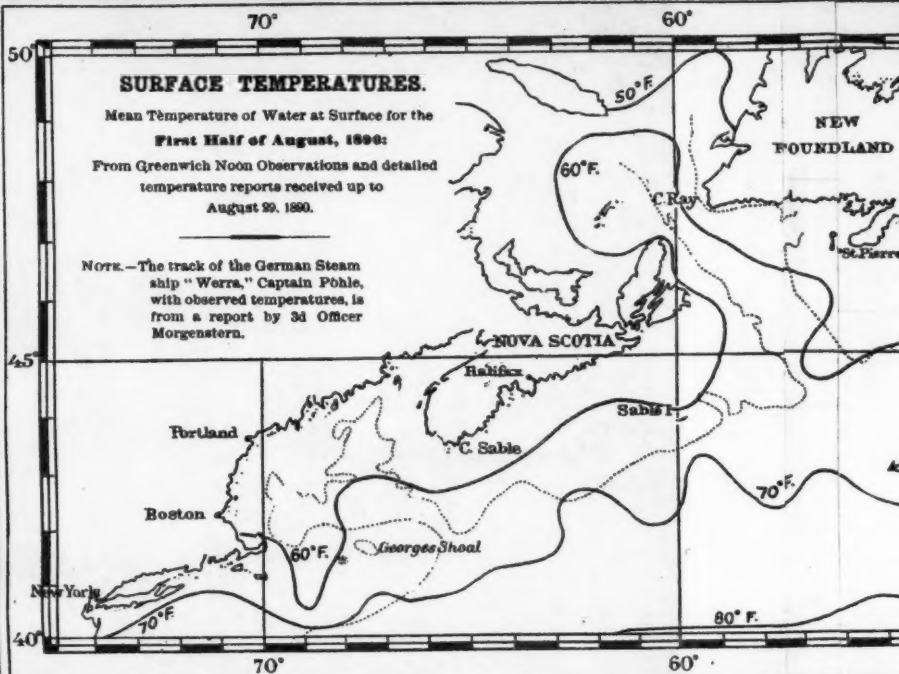
Esquimalt is the headquarters of the British fleet in the Pacific, and the Dominion Government has built a fine dry dock there. This harbor will some day be the terminus of another Canadian Pacific Railway, which may be called for convenience the Canadian Interoceanic Railway. This line will cross to the mainland at Bute Inlet by bridging the channels between the islands, and run through the Rockies *via* the Yellow Head pass. It

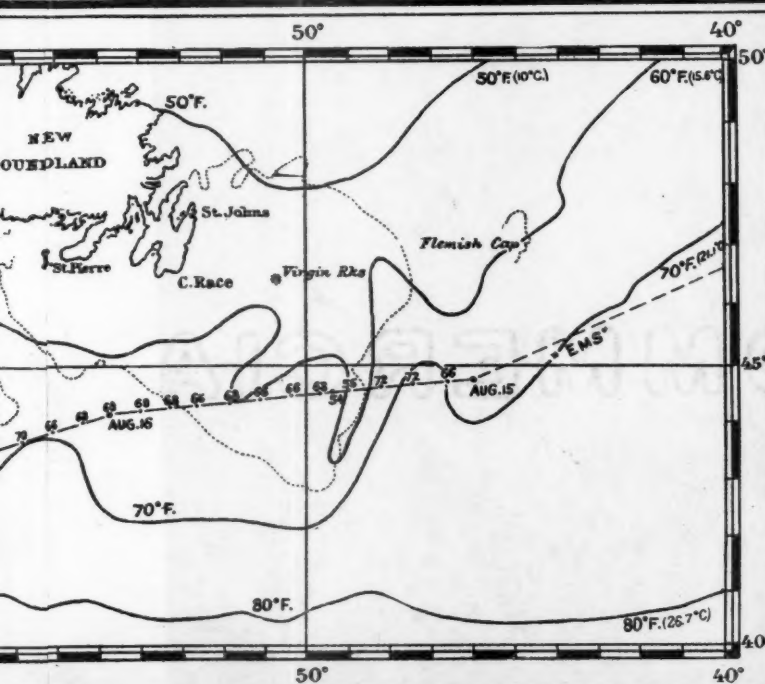
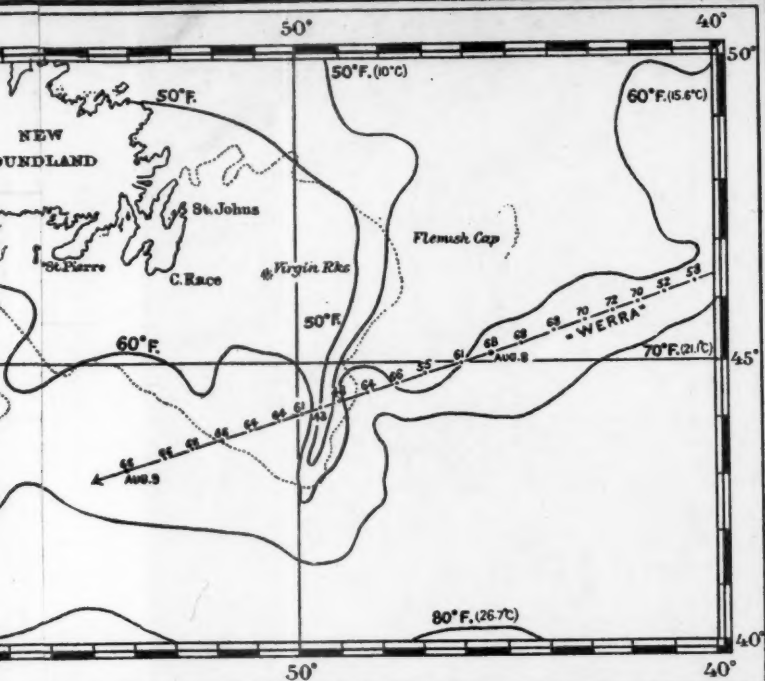
will probably make connections with Vancouver City as well as Esquimalt, and taking the shortest route to Quebec City, St. John, N. B., and Louisburg, C. B., with a branch line down the Ottawa Valley to Montreal, it will be the air line between the two oceans, will have easier grades than the Canadian Pacific Railway and run through a fertile country nearly all the way. For the present the Canadian Pacific Railway serves the country very well : not only is it the shortest line across the continent, but its elevation is so much lower than that of the American lines and its grades as a rule so moderate that, even if the distance were the same, better time could be made and freight hauled at less expense, especially in winter when the highly elevated American lines are often blocked with snow. Already a mail bag has gone around the world in sixty-nine days by the Canadian route, and it is believed that when fast lines of steamships are running on both oceans in connection with this railway, the journey around the world can be made in sixty days.

If the Atlantic and Pacific formed one great ocean instead of being divided by the American Continent, the route of ships would undoubtedly be directly across the part of the globe now occupied by the Dominion of Canada, in order to take advantage of the shorter parallels of latitude.

Before the completion of the Canadian Pacific Railway, this great body of land was an impassable obstacle in the way of direct commerce between Europe and Asia, but now it merely serves to hasten the passage and break the monotony of a long sea voyage. The ship, transferring its cargo and passengers to the railway,

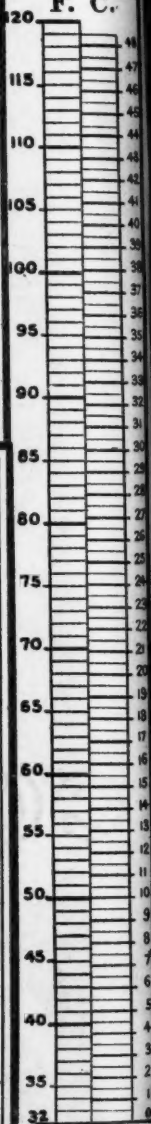






COMPARATIVE  
SCALE,  
Fahrenheit  
and  
Centigrade  
(or Celsius)  
Thermometers.

F. C.







makes shorter voyages, requires less coal, and is therefore able to carry larger cargoes, or utilize the coal in increasing its rate of speed. In winter the ship from Europe seeking a port of trans-shipment will find in the maritime provinces of Canada some of the finest harbors in the world, hundreds of miles nearer home than any port of the United States, and close to inexhaustible supplies of first-class coal. In summer it can pass up the St. Lawrence to Montreal, nearly one thousand miles inland, yet about three hundred miles nearer to Liverpool than New York. The ship from Asia, almost irresistibly carried toward Canada by the Japan Current, finds in British Columbia the finest harbors of the Pacific coast with the best and cheapest coal. Thus favored by Nature, the Dominion seems designed to be the commercial highway of the world, and having a most extensive system of internal navigation, great mineral resources, fine forests, prolific fisheries and hundreds of millions of acres of agricultural lands, while the climate throughout its vast extent is everywhere invigorating, the Canadian people must eventually become a great and powerful nation.

## MODERN ICELAND.

BY

PROF. CHAS. SPRAGUE SMITH.

History is the resultant of the interaction of two forces, man and his environment. In the pathless forests, the closely pressed, massive firs, birches and maples with their tufted crests, forming a canopy one hundred feet above us, shut away well-nigh completely all of earth and all of sky. All sense of direction is lost. The level sun cannot force its rays through the interspaces in the wall of trees; the vertical sun, unless poised absolutely above our heads, cannot indicate to us the mid-point in its diurnal arc. We ask of the blue patches of cloudland above and of the dim aisles about us in vain whither we shall turn.

But the experienced woodsman, allowing his eye to follow the ragged trunk of the birch or the firm brown bole of the maple, observes carefully in which direction the souple crests bend.

"Yonder lies our course," he says, "for the trees bend eastward." We know almost a sense of pity, of fellow-feeling, for our brothers the children of the forest, when we also observe that, despite their erect might, the proud crests have been compelled to do obeisance to a superior force. For, unless our life course has been very brief, we also, amidst all the pride of conscious strength and eager insatiate aspiration, have been forced

to bow. From whatsoever source or sources the race dispersion moved, that has given its populations to the two hemispheres, every pebble in the stream-bed, every zephyr that ruffled the surface, every influence from without, whether silent or sonorous in its manifestation, has left its impress. Thus children of one stock, one blood, one heritage, became differentiated into races widely separate in character and customs.

And when the mighty west wind sends forth its phalanxes and, in charge on charge, urges on the assault upon the firm erectness of the forest kings, we sit beneath their shadow, in the safe shelter of their marshalled hosts, and listen to the sounds of the conflict. Bending before the shock of the assault, the tree-tops hold the winds and, as it were, repel them. And the hoarse voices die gradually away into a distant moan or forest murmur. Then anew, far above, we hear the advance of the vanguard, a whirring as of wings in the foliage, growing clearer, louder each instant; until, with a roar, as when the surf breaks upon a rocky coast, the attack is renewed. The multitudinous crisp fluttering of the leaves, intermingled with the hoarse creaking of the boughs, follows, and the force of the onset is again spent.

Even more of charm is offered to the student of history. From the safe eyrie of the present, he can look backward and downward upon the struggles of the past. There man wrestling with nature succumbed. Here in azure girdled, azure roofed Hellas, he led nature captive, reading her laws of beauty and immortalizing them in marble and words.

And, as the student's eye sweeps with affectionate in-

terest the horizon, it turns at last northward. As from an inexhaustible spring of native unsullied energy, there flowed southward, during the first centuries of our era, streams of humanity to revitalize, renew the decadent, exhausted South. So through myriad waterways the fertilizing Nile is led into the parched fields of Egypt.

And amongst all the Germanic tribes, the northernmost perhaps contributed most of stimulus, most of energy, tipped with the fire of enthusiasm, and held to the tense bow-string of determination. Away it whirrs and wherever it falls, its magnificent life is infused into the dormant or decadent societies.

Instinctively we ask, if the Norse energy transplanted could and did communicate such vitality to the masses of life with which it was brought into contact, what did it effect at home?

Norway cannot answer this question, for the wasting of its best life in wars, or the loss occasioned by emigration, combined with other forces, operating from without, stunted and held back the natural development.

Iceland answers it. That answer is distinct among histories, alone among literatures, rugged, masculine, powerful. The Norse life found here its just expression almost entirely free from foreign influence. And, as in the forest, nay, more than in any forest, that struggle between the creature, the life, and its environment is filled for us with human interest.

It was not a fertile promised land, not even a rock-bound New England, that the Norseman discovered and occupied. It was an old battle-ground, where the

giants of frost and fire had been contending ever since it emerged from the sea. Seamed, scarred, blasted, the pores of earth sealed with congealed lava or choked with volcanic sand, that whole island the giant of fire claimed as his domain. Only a narrow interrupted strip of verdure surrounded the waste central plateau. The frost giant, silently, constantly at work, hooded the volcanoes with ice-caps, or ever their fires were extinguished, and, compressing the summer within the narrowest limits, chilled the heart of nature. Her enfeebled vital-force could only yield a close short grass and a low shrubbery of birch, fir, or willow.

In favored localities the kernels deposited in her bosom might be warmed into living-life, and green spires of grain rise through the broken soil.

But such conditions were rarely present, and fruit or timber-yielding tree was unknown. No wealth from soil, none stored up in the veins of the mountains; a region exposed to the inclemencies of a northern winter, tempered by the equatorial stream, it seemed rather adapted by nature to become the Labrador of the Old World. We might have expected that the fisherman would build his hut upon its shores, and perhaps pasture his sheep in its intervalles. But that men in numbers, sufficient to form a state, should voluntarily select this island as their home, with the whole world open to them, seems indeed surprising.

The struggle with the environment was a protracted one. Only Norse energy could have wrested from the surrounding conditions so much of permanent value in manly effort and achievements. Iceland had organized a united democratic state, controlled by a senate of

chieftains, before Hugh Capet became king of France.

While in Mediæval feudal Europe the common man was esteemed little better than the beast of burden, the common freeman in Iceland, save for his exclusion from the ruling assemblies, enjoyed equal recognition with any. As the tales of the first settlers were told at the yule-feasts, or in the booths at the Althing, no one's blood flowed in prouder waves than his. They were his countrymen, his kinsmen, his brothers, equal, not superior, in birth-rights. In all the literature of modern Europe, I find nothing that leads me back to nature, into the immediate presence of her rugged primal forms, so directly and entirely as the Old Norse literature, whose almost exclusive home was Iceland. And, to me at least, it seems a source to which it were well for much of our emasculated thought and expression of the present day to turn. But the picture, rude and vigorous, in outline and coloring, of that age, I shall not attempt to hold up before you in these pages.

Iceland's life, as a free state, ceased in 1262-64 through voluntary submission to Norway. All the forms of her democratic state-organization were replaced by crown-offices. Self-government vanished, and with it died the Norse buoyancy of spirit and dauntless energy. The six centuries following upon the union with Norway are essentially barren of interest. Without unfolding the volume of her records during that long period, we turn therefore to the Iceland of to-day.

And now I shall invite you to embark with me upon the *Laura*, the larger of two Royal Danish mail-steamers plying between Copenhagen, the Faroe Islands and



Iceland. Arriving late in the evening on the "Flying Scotchman," the beautiful city of Edinburgh retains us only for an hour.

The chasteness of its architectural lines, the charm of its clean, broad streets, the quiet coloring of its drab and grey buildings, the lyric poetry of its myriad squares and of the thickly-foliaged slopes, that descend so precipitously into its picturesque ravines, the grand hill-fortress crowning all, a mediæval heroic epic in stone seen for a moment, leave upon the retina an impression of civilized life and of art, that will rise ever and again, in vivid contrast, in presence of the scenes of the northern world. At day-break we are off the eastern coast of Scotland, a line dim and low in the distance, lost wherever a deeper bay indents the shore. The Orkneys enveloped in mists are half-seen, and then the eye turns ever northward, seeking to glide between sky and sea, and grasp at last the dream realized, incorporate, of this northern world. For however so wide one's journeyings, when the keel leaves the beaten ocean track, there is a sense of penetrating an unknown, only half-discovered region.

On the third morning, the mate tells us that land is in sight. In the midst of the North Atlantic rises that picturesque group of rocky islets known as the Faroe Islands. The equatorial stream, pressing northward, with its accompanying warm currents of air, heavily charged with vapors, finds its course suddenly barred by an irregular line of stone fortresses. The heavy air seeks in vain to pass their crests and, in sluggish trailing fog and dissolving cloud, the south winds leave half their burden behind. The Faroese hopefulness finds

notwithstanding expression in the title of one of their two weekly publications—*Dimmaletting*—the lifting of the fog. And nature were chary indeed, if she responded not at all to such persistent good will. So at times, she is said to draw aside the fog-curtain and reward the faith of the islanders with fleeting glimpses of the sun. As we wind out and in among the fjords, we rarely, if ever, escape the impression of being in mid-ocean. The Rhine and Hudson, on their way seaward, at times are pressed closely by vine or forest-clad hills, and the traveller's eye is charmed with the gentle, refined grandeur of the scene.

Broaden the river bed fourfold; strip the mountains of their verdure; leave them naught but bare rocks, cut seaward in precipices of several hundred feet, and lift them to a frowning fog-mantled height of from two to three thousand feet.

And, for the poetry of mediæval castle or modern chateau, con over in memory the songs and tales of the Vikings, who, through these winding ocean-rivers, turned homeward from some piratic foray, or swept seaward to win name and booty. You hear again their voices joining in some wild, harsh, strong, alliterated pæan of battle and victory; you see the broken, cold, grey-blue of the fjord cut into glittering foam by the sharp keels, pressed onward with the sinewy strength of proudly-rhythmed Norse oars. Emerging from the fjord, we are at once in mid-ocean. And, as the rugged, tempest-scarred battlements shroud themselves quickly in the fog and night, it is as though we had awakened from a vivid dream of Viking-times.

Iceland was discovered by a Norse sea rover, Naddodd, who,\* while seeking the Faroe Islands, was driven out of his course. Our ship's head is now turned in that direction and, for two days still, we shall have only the larger and stronger-winged sea-fowl of the North Atlantic, to indicate to us that we are treading unaccustomed water ways. Like everything animate and inanimate here, the breath of the storm has passed over them, the ruggedness of primitive nature has been infused into them. Or, is it only our enkindled fancy, for they seem to buffet the air with more of conscious strength, and to extend over the darkened sea a broader expanse of white and grey wings. Late in the afternoon of the third day, low precipitous crags are in sight.

Indeed, for some hours previous, the clouds to the north have defined, without disclosing, save to willing imaginations, the forms of that broad system of glaciers that occupies the south-east of Iceland, the Vatnajökull (glacier of waters). The crags in front are the outlying islets of the Westmanna group. When Ingolf, in the last quarter of the ninth century, set sail for Iceland to effect the first permanent Norse settlement, he had as companion Hjørleif, a sword-brother and husband of his sister. The pious Ingolf offered sacrifices to the gods and, when off the south-east coast, threw the pillars of his high seat into the sea. As the waves received them, the devout Norseman promised Odin or Thor, that he would dwell where the pillars, divinely guided, were cast ashore. But Hjørleif made no sacrifice, threw overboard no pillars for winds and waves to

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\*Latter half of ninth century.

toy with, but self-reliant, took land where it seemed good to him. He, who recognized the overruling hand of the gods, became the father of the Icelandic community, and the desolate shore, upon which his pillars were left by the receding waves, is now occupied by the wharves of Reykjavik.

But Hjörleif fell beneath the murderous hands of his thralls, West-men, Celts, who fled to the islands lying perhaps half a-dozen leagues off the coast, but escaped not the avenging hand of Ingolf. The group bears their name, being called the islands of the West-men. As we draw nearer, we remark that the brown and the iron grey of the rock is curiously seamed and dotted with white. Approaching still nearer, the seams disintegrate, the spots disappear and, in their stead, the whole air in front of the crags is sown with countless, glancing wings. As when cold, light snow flakes, lazily falling through the still interspaces of air, are seized by a passing gust and, in a confused whirl, circle in and out, now massed, now separate.

The steam-whistle shrilly signals our approach. And, at once, from their perches upon the cliffs, from their circlings in mid-air, the gulls, the guillemots, the auks, the puffins and myriad other sea-birds I do not recognize, sweep outward and upward from the ship, forming, as it were, the lower curve of an ellipse of white whirring wings. And, as the impelling fear loses its force and the desire for the nest or for repose strengthens, the ellipse curves backward, an almost unbroken arch. A second blast—the air is filled with a confusion of glancing wings. Then the resonant cliffs become silent as before and, through the air, as fall the snow flakes when

the gust has passed, descend on fluttering wings the birds, each returning again to his perch.

The anchor is weighed and, with the afternoon, the clouds lift, and we see the surf beating and breaking upon the south-west coast of Iceland. As day descends, the clouds and vapors, floating in mid-air, vanish.

To enter the Faxa Bay at night, when summer reigns and the air has the crisp clearness of a morning in the Alps, is to turn a new page in the book of nature. \* Day has only departed for perhaps three hours, and her throne is held by a presence that delights in mellow radiance. The clouds are glowing with the living colors of the first hues of sunset, or the last before sunrise. The sea is smooth as a lake and all about mountains rise, softened in their forms, harmonized in their coloring into perfect accord with the chaste beauty of the whole. Towards delicately flushed mountains, beneath a pellucid sky, over a whispering sea, with an horizon girdle of glowing clouds about us, we approach the goal of our journeying.

Were the whole of Europe to be compared to the human body, I should conceive of France as the throbbing heart, of Germany as the brooding intellect, of England as the active hand. Such a distinction of functions, in the economy of European state life, is, I need not remark, only defensible as a perhaps suggestive figure. In 1789, 1830 and 1848, the quickened pulsation of France, that enkindling of hopes and their partial fruition, was communicated to all Europe. There is always and everywhere, in enthusiasm, a spirit of generosity, whose wide-reaching effects survive long

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\* Longest day in Reykjavik, 20 hours, 54 minutes ; shortest, 3 hours, 58 minutes.

after the source from which they flowed has become chilled into indifference, or even despair. The rebirth, politically, of Iceland can thus be traced back to the movements of 1830 and 1848. With 1830 that political agitation began in Denmark, which fostered and prepared the way for the present partial independence of Iceland. And there came, in the midst of that struggle, a moment rich in dramatic interest, recalling that other pregnant moment in 1789 when Mirabeau, in the name of the French Assembly, declared to the royal representative, who had ordered the delegates to disperse, "We will yield our places only to the bayonets."

In 1851, a national assembly had been convened in Reykjavik to consider and report a plan for the future relations of the island to Denmark.

A proposition, drawn in Denmark, had been presented, but it did not secure the desired autonomy.

Under the leadership of Jón Sigurdsson, the delegates brought in, therefore, a new bill. The royal commissioner, having sought in vain by censure and by the presence of Danish soldiery to overawe the assembly, declared it dissolved. Thereupon Jón Sigurdsson rose and said: "I protest in the name of the king and the people against this proceeding," and the members rising, with almost one voice, responded: "We all protest."

Honor, the highest human honor, to Jón Sigurdsson, whose patient, persistent patriotism, wise counsels and unselfish life accomplished for Iceland what others have effected in larger spheres for other communities. He is their peer in all that constitutes manliness, for, not the opportunity nor the gift, but the use thereof, determines the measure of human worth.

Out of the long struggle came first, in 1854, free trade, or what is essentially equivalent thereto, and in 1874, the millennial anniversary of the settlement of the island by Ingolf, Christian the IX. brought to Iceland her present constitution.

A minister for Icelandic affairs resides in Copenhagen, and forms the medium of communication between the dependent state and the King of Denmark. Administratively, the island is controlled by a governor, two vice-governors (*Amtmenn*), and eighteen provincial magistrates (*Syslumenn*).

Under these again we have officials in charge of the poor-rate districts or "rapes" (the *Hreppstjorar*). The local magistrates from the *amtmenn*, or vice-governors, down, are assisted in the discharge of their functions by advisory boards. So far as I have been able to ascertain, however, all offices in the civil service are conferred by appointment, save those of certain of these counsellors, who are named by popular suffrage.

The *syslumenn* fill, like a certain Chinese dignitary, known to operatic fame, all offices; they are collectors of taxes, bailiffs, auctioneers, judges of first instance, etc. From their decisions an appeal can be made to a superior court of three judges, sitting in Reykjavik, and from this in turn to Copenhagen.

The Althing, or parliament, shares with the king the power of law-giving and has exclusive right of taxation. No law, however, is valid, unless it is sanctioned by the king.

Iceland receives from the Danish treasury a fixed annual allowance of 60,000 crowns, £3,333, as indemnity for losses sustained in consequence of the royal



confiscations at the time of the Reformation, and of the ruinously oppressive royal monopoly that held in full force until 1786. The island returns nothing in taxes, and is exempted from military obligations.

The Althing sits biennially in two chambers; an upper house of six members, appointed by the king, and six elected by the people, and a lower of twenty-four popular representatives. The Church forms also part of the state organization.

Iceland is divided ecclesiastically into one bishopric, 20 deaneries and 299 parishes, with (in 1888) 141 livings. Bishop and deans are appointed. Priests are chosen in this wise: Three candidates are sent, by the governor, and of these three the parish chooses one, who is thereupon confirmed by the bishop.

Livings, however, which yield an annual income of over 1,800 crowns (\$500), are conferred by the king.

The state Church is Lutheran, but since 1874 religious freedom obtains. In 1880 there were 12 inhabitants who did not accept the Lutheran confession, including 1 Catholic, 1 Methodist, 4 Unitarians, 3 Mormons, and 3 without stated belief.

The state also cares for the bodily welfare of its citizens. There is a "landlaeknir," chief physician, resident in Reykjavik, who is appointed by the king, and some twenty-five physicians, assigned by the governor to different localities. These are subject to the visitatorial inspection of their chief.

The clergy, save the bishop, are dependent upon their prebends, upon tithes and perquisites; the physicians are enrolled in the civil list and also, I understand, are recipients of certain fees.

The governor's salary, including special appropriations for secretary, etc., is \$3,450; the bishop's, \$2,225.

Educationally, the university grade of instruction is represented by two faculties at Reykjavik, medicine and theology, from which the staff of priests and physicians is constantly recruited. Beneath these stands the Latin school, corresponding to the German gymnasium. There is also an institution in the north, at Möðruvellir, near Akreyri, which corresponds to the German Real-Schule.

My host and friend, Dean Thorarinn Bodvarsson, has also founded, in memory of a beloved son, an institution of higher general training for lads at Hafnarfjörðr, near Reykjavik. These latter schools attract comparatively few pupils; the Latin school is, however, well attended. There, are besides, four girls' schools, three in the north and one at Reykjavik, in which a certain general instruction in history, geography, arithmetic, etc., and the housewifely occupations is given, but here again to very few pupils.

Elementary instruction in the few towns is cared for in schools; in the country by the parents, the priests or private teachers. For confirmation an ability to read and write is required.

The population of the island, according to the census of 1888, was 69,224; of Reykjavik 3,599; of Isafjörður, the second town in size, 692; of the five largest settlements, excluding Reykjavik, 2,761. In three years the population has decreased by about one-thirtieth. This is due to emigration. The vast majority of the inhabitants are distributed in isolated farms, occupying the narrow belt girding the waste central plateau.

In general it may be said that these farms are hardly

more numerous than villages in the more thickly settled countries of the Old and New Worlds.

We are wont to think of Iceland as an exceedingly remote region, and yet it is only 500 miles distant from Scotland, 600 from Norway. It has a superficial area of 39,200 square miles, being thus about four-fifths as large as the State of New York.

Its greatest length is 300 miles, its greatest breadth 200. Two fifths of the island are said to be habitable, nearly one-fourth entirely waste. The traveller's impressions would enlarge the latter fraction at the expense of the former. While lying only just below the Arctic circle, owing to the equatorial currents and its insular position, the range of variation in the temperature is limited, and the extreme of cold far less than we should imagine from its proximity to Greenland. The mean temperature of the year in Reykjavik is  $38^{\circ}$  Fahrenheit, of the summer  $54^{\circ}$ ; in Grimsey, in the extreme north, the yearly average is  $34\frac{1}{2}^{\circ}$ .

Iceland has no manufactories.

Its population along the sea-board depends upon the fisheries, in the interior valleys mainly upon sheep-raising. Its exports are fish, oil, sheep, salted meat, lamb-skins, ponies, eider-down, feathers, and a certain quantity of mittens woven from the Icelandic wool.

A witty Scotchman whom we knew in Reykjavik, an ancient mariner of kindest heart and hand, never mentioned Iceland without styling it—"the God-forgotten country." According to him, when the Divine Being, having completed his work of creation, declared, "It is good;" Satan, standing beside Him, thought, "I too would like to try my hand."

Being accorded permission, at his command Iceland rose from the sea, and his sombre majesty also declared, "it is good."

The island might almost be described as one vast volcano, once submarine and now with myriad sealed craters, behind whose stone doors crouch fiery floods, that at any instant may burst forth anew.

It is formed of basalt, lava and ashes. The east and west fjords, the oldest parts of the island, are constructed almost entirely of strata of basalt, placed the one above the other. The centre of the island, especially the central plateau, upon which the glacial mountains (the Jökler) rest, consists in great part of tufa, a composite formation of hardened volcanic ashes and sand, resulting apparently from eruptions and accumulations at the bottom of the sea. From this highland rise those sharp peaks of lava and of white or red trachyte, that, at a more recent period, broke through the tufa-crust.

In the cooling of the basalt deposits, frequently great clefts were formed and, through these, the volcanic fire could easily rise to the surface. The diversity in geological character between the different parts of the island has determined its varying physical aspects. Where the basalt predominates, the water has, as it were, been forced to hew its way over or through iron barriers, and precipitous crags and irregular fragments of rock mark the course of the streams and the lines of the bays. Where the softer tufa occurs, broad valleys, gentle slopes and rounded elevations result.

The island rose gradually from the sea, and, in the Miocene period, had a climate and vegetation re-

sembling those of Central America (Florida and Mexico), to-day.

The glacial age came to Iceland as to all northern lands, and, as the ice melted, the island began to assume its present appearance.

The lava beds that cover such vast areas, in part antedate the ice-age, but are in the main of more recent origin. The earlier lava streams were, of course, in many cases smoothed and filled up by glacial action. The formation of peat-bogs from the vegetation, and of soil from the clay deposited by the glaciers had the same history here as elsewhere. Since the settlement of the island in *circa* 870, there has been very little change in the physical conditions. Glaciers, *i. e.*, glacial mountains, occupy nearly one-seventh of the entire superficies. The Vatnajökull alone covers an area of about 3,200 square miles.

Volcanic eruptions are known to have occurred during the last 1,000 years in some 20 different places, but many outbreaks passed unobserved, since their fury was expended upon the desolate central regions. We have evidence of 18 eruptions of Hekla since 1104.

In 1783, from the Skapta-jökull two streams of lava issued, the one 50 miles in length, from 10 to 12 miles in breadth and 100 feet in depth, the other 40 miles in length and 7 in breadth. An area of 420 square miles was covered. One-sixth of the inhabitants and one-half of the live stock are said to have perished, as direct or indirect consequence of this outbreak ; though this official estimate is declared by some to be an exaggeration. \*

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\* Poestion (Island, page 119) gives as dimensions of streams : First stream, length 10-11 Danish miles, greatest breadth 3 miles ; second stream, length 9 miles,

Iceland has essentially no mineral wealth—iron, copper in small quantities, Icelandic spar, aluminum and coal exist in one or more localities, but apparently not in sufficient quantities, save the spar, to repay working. Lignite also occurs, and sulphur in extensive deposits. The latter may at some time attract and repay foreign energy and capital.

Away now from statistics to the presence and friendly hand-clasping of the people, and to communing with that bleak northern nature.

No forest will limit our vision, as it is sent forth upon every radial line to the encircling horizon. For Iceland never produced anything save low stunted trees, even in the ninth century, if we can trust the record of the trunks, that the soil has mummified; and to-day the Icelandic "*skóg*" (forest), translated into terms of an English landscape, means this: Low birch, willow, or juniper bushes, in rare localities, form thin groves with an average height of perhaps 8 to 12 feet;\* elsewhere they crouch earthward like poor hunchbacks, or, if timidly and feebly venturing skyward, allow often the wild geranium to rest the fresher green of its leaves and stalk against their seared stems and fluttering foliage, while its purple cup, lifted high above their crests, quaffs unhindered the wine of air and sunlight, and nods a bold and blithe welcome to bird and insect.

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breadth 2 miles. Depth of lava, in places 500–600 feet; in the plains, however, not above 20 feet. A Danish mile equals 4.6812 English miles. The official reports give losses as follows: 9336 men, 28,000 horses, 11,461 cattle, 190,488 sheep.

\* Kaalund. "*Bidrag til en historisk-topografisk Beskrivelse af Island*," Vol. II., p. 143, speaks of a grove where trees reach a height of from 16½ to 18½ feet. Personally I never saw, outside of Akreyri, a bush above 7 feet in height, but I did not visit the few most important forests of Iceland.—(C. S. S.)

One meets everywhere with open-hearted, free-handed hospitality, honest, intelligent, but heavy, careworn and rather downcast faces. None of the Anglo-Saxon push, or the French *esprit*, fire eye and steps; but there is a patient plodding expression and carriage; the horizon, material and spiritual, is a very narrow one. The son cannot rise in fortunes much above the level of the father.

He might do so, or a later generation might, if he would emigrate; but love of country is strong.

The degenerate Greek is said to loiter all day about the cafés, an idler and good-for-naught, swollen with pride in an ancestry to whom the world will always owe an incalculable debt, for its eager endeavor, that reverent search for and loving recognition of the true and beautiful.

\* But they are not his ancestors, they are ours. The worker and producer enters by divine right into the exclusive heritage of all the working past. The Icelfander, proud of that heroic past of Saga times, that bloody, cruel past, whose memories he cons over in the hours of enforced or induced idleness, is loth to follow where Leif and others his landsmen, nine centuries ago, marked out the way. His language is pure from foreign admixture, from weakening contractions and loss of grammatical flexions, pure as no idiom of cultivated central Europe. He will hold to the ancestral heritage, in soil, speech and customs, and the world without can "gang its ain gait." Well, if he has degenerated, as we at least are convinced that he has, in energy, in enthusiasm, in that adventurous spirit, which always is pushing back the visible horizon,



and at times with such energy that, as with a Leif and a Columbus, the diaphanous veil is dissipated and a new world revealed; if the internal qualities and the external material conditions have deteriorated in many respects, the old Norse welcome is just as hearty as ever, and the home, be it a turf-walled, peat-reeking hut, or a roomy, comfortable frame house, has its door standing always wide open to the stranger.

The towns are fishing hamlets, with a certain added gentility and scholarly culture, diffused from and within the educated circles.

But the typical Icelandic life of to-day is not to be found here. We must wander away to the home of some farmer, be he rector or husbandman (*bóndi*), and, in his simple study at nightfall, or, leaning upon the turf-wall surrounding his domicile, at the hour when the sheep are returning from the mountain pastures to right and left of the valley, win our way into his confidence. He will not have much to tell us. Little that would appeal to us beckons from his present or his future, but honest faithfulness, in the midst of a very narrow circle of duties and possibilities, is his approved claim to our hearty respect.

At times we shall meet men whom contact with the outer world has transformed.

They will display, perhaps, the urbanity of a cultured scholar or the ready wit of a French "*causeur*;" but these travelled tillers of the soil are few and rare.

To watch at daybreak his servant, or son, or daughter leading the sheep away to the hills; to perform the rude services demanded by his simple stock-farm; to shoe his horses and repair his tools in his own smithy,

and, when the meadow grass is a few inches in length, to go forth with his farm-hands and swing in quick, straight lines, not in long, slow, rhythmic curves, his straight, short-bladed scythe; to load the hay upon his ponies, or watch by the barn entrance while they return with their evenly-balanced hundred-weights, and estimate thereby the year's fruitfulness; to carry the products of his dairy and farm, butter, cheese, hay, cured meat, etc., to the towns and there exchange them for coffee, sugar, grain or boards, or, perchance, some womanly vanities for the good housewife; to join with his neighbors in the folk-sports of wrestling, etc., what time the sheep are collected from the high mountain pastures; to read aloud in the winter-days from the old sagas or from some book of devotions the while the women spin—such is the round of his duties and vocations.

When a wayfarer on horseback approaches, he will go forth to meet and welcome him and, a half hour later, over a cup of chocolate or coffee, with a little glass of liqueur, they will exchange their budgets of gossip. But, while we have been lingering with the farmer, interchanging news from the wide outer world for facts and fancies woven from the life of this narrower circle, the good-wife has been bending over the glowing bed of peat-cinders, preparing our breakfast.

It is early August and the succulent ribs of the mountain-pastured lamb would tempt even an epicure, despite the rudeness of cloth and table-furnishings. Fastidious appetites, however, would go a-fasting here, unless stimulated into common sense activity by the invigorating qualities of this northern air and scenery.

For, not merely the inferior quality of the viands, save the lamb and milk, and the absence of variety characterize, of necessity, the farmer's table ; but also, far too frequently, there is an entire lack of domestic and personal neatness.

The transparent purity of the atmosphere and the sparkling clearness of the brooks and rivulets, that pass their very doors, should suggest to this island people the thought of suffering the air indoors to become as free from pollution, as that without, and holding their life, on its physical side, as clear from soil as the water of their mountain springs. But to-day the indifference of these Icelandic farmers, as a class, to neatness offends every sense as well as every hygienic law. The good farm, whose turf-roof covers us, forms, however, we assume, an honorable exception to the rule. Though our host may only have two tumblers in his china-closet and our party must therefore imitate elder days and pass the horn, a prosaic horn, from hand to hand, as we quaff the abundant milk, every thing indoors is as neat and wholesome as conditions permit. After breakfast, having taken a last look about the low guest room, where chests supply largely the place of chairs, and a rude table and bed and small hanging book-shelf, with its rows of well worn, brown-backed volumes of sagas and books of devotion, complete the inventory ; we pass through the dark narrow passage-way and, stooping at the low entrance, find ourselves again in the open air.

Our ponies are all in readiness, we mount, call out as farewell to host and hostess, "be ye blessed," and ride away.

The farm-stead, with its line of low structures, turf-

walled and roofed, with white wood gables facing the outer world, will long remain in sight, commanding the valley from its little knoll. The "tún," or home-field, is enclosed between broad, low walls of turf and a bridle-path, similarly walled, conducts us across it and out into "no-man's land." For certainly I cannot conceive of any one desiring to lay claim to the desolate, hopelessly desolate, infinite expanses of barrenness, that press so closely upon the oases of the farms.

Away then out into this world of Iceland.

We have steeds beneath us that are as swift as thought and as wayward as fancy. They are thought and fancy turning backward to linger, or hasten, amidst scenes that once impressed the willing senses. Come then and wander with me upon such coursers hither and thither about Iceland.

We are traversing the south-western peninsula, at a leisurely pace. At nine o'clock A. M. we had our first meal and, with a few cheese sandwiches in the saddlebags of the good Dean, our guide and host, we expect to endure until the twelve-hour sand-glass is turned.

Our party consists of three, the Dean, an Icelandic lad and an American. We have clattered over, or painfully clambered over, lava streams *ad infinitum*, struggled through broad, deep stretches of sand and driven our ponies at a mad pace over every kind of track, save a smooth hard meadow.

We have forded rivers and scaled mountains, and learned meantime a few strophes from an Icelandic song, descriptive of the Fatherland.

We are now in a particularly desolate region, a valley of sand, high up among the hills, surrounded on all

sides by conical elevations of sand, ashes and other volcanic deposits.

The two younger members of the party are tempted to test their ponies' mettle and, dashing with wild halloo down the steep slopes, reply somewhat tauntingly to the Dean, who urges greater forbearance. "Well, I'll set the pace," he retorts, and away he flies on his squarely-built grey charger, leaving our panting ponies far in the rear. Up the hill-side we clamber over lava-fragments of every color, grey, yellow, purple, iridescent, from opaque almost to transparent, and with pink and white flowerets strewn here and there.

But, long before the hill-crest is gained, we are sedately moving, in slow and single file, the Dean leading. A moment later, and the eastward side of the rib of mountains, that we are crossing, slopes away from us down into the valley, many hundreds of feet below.

The sea stretches cold and blue far away to the southward. And beneath us winds in and out a valley, narrow or broadening as the boundary hills permit, dividing northward into separate arms, and lost to sight, where it curves behind a distant projecting spur.

It is a wide valley, resembling in its contours many a grass-carpeted vale, where we have seen farms and rectories clinging to the base of the hills, or perched on little knolls, mid-plain, whence to overlook their domain of meadow and pasture-land, and lure homeward at nightfall the shepherd and sheep.

But a river has filled it all, a deep, strong, angry river of molten lava and, over yon slope, it has poured into the sea. The bordering hills are all seared and blasted, as if from the breath of a furnace, and the

conical mountains, pressing each other all about, are extinct volcanoes. It does not require a very vivid imagination to remove the seal of death from this stream. For the waves, even as they broke high in air, were transformed into sharply serrated ridges of stone, and the eager surf, chafing against the border walls, became heavy and congealed, ere it could shrink back into the river-bed. What an inferno of flame and noisome exhalations must have risen from this immense moving caldron, to blast and blacken the light of day!

Yet it is but one of a number of these lava valleys that our ponies must cross to-day. Thorvaldr Thoroddson counted in this peninsula alone 300 volcanoes, with some 800 distinct craters.

And summer is so brief here that, even in a thousand years, nature has not been able to repair the ravages of that remote chaotic upheaval. Flinty and almost as barren as at the first of even a blade of vegetation, many of these rigid rivers remain even to-day; over others time has spread a grey veil of lichens, and others still have perhaps disintegrated slightly, or, more probably, have jealously guarded the few grains of soil, lifted mid-air by the winds and thence descending, as a scant fertilizing shower, upon their barren crags. Ere long, the same forethoughtful winds, loving to beautify nature's waste places, let fall seeds; or strong-winged birds forgot, in the joy of wild responsive cries, the grains they were bearing to their rocky eyries.

These seeds fall not all on stony places. And so, when June reaches Iceland, were it not that the physical vision is dulled and blinded to the most beautiful and wonderful things that are taking place about us, a

breath of spring might be seen, just touching the lava crests, and, in white and yellow flowerets, leaving turned a page of nature's book. As we pass, we read, and hope shoots forth anew her timid spires in the waste places, if such there be, of our present and future.

Pass, oh picture, left upon the memory by the volcanic world of the south-west, and give place to the impressions traced by the scenes and experiences of the central desert.

The party is in number the same, but the good Dean is in his quiet rectory at Garthar, that looks down over an enclosed rectangle of grave-mounds at the blue bay of Hafnarfjörthr, and beyond at the sombre line of volcanic peaks, rising forth from the midst of that desolation of the south-west. The two companions of the American are young Icelandic pedagogues, on their way to their northern homes.

Since leaving Reykjavik we have seen little but waste land.

Heath (heithi) in Iceland means a region of sand-hills where at times a coarse grass or wild grain strives to grow, but with scant encouragement, and we have been on heath moorland or lava now for more than two days.

Here and there, in the river bottoms, or in the sheltered nooks hollowed out by some kindly providence in the leeward slopes of the hills, we have found pasturage for our ponies. We have visited the Thingfields, site of the old Icelandic Parliament, the levelled bed of an ancient lava stream of immense breadth.

A section thereof four miles in width has become depressed, probably through some later seismic action,



and the high lateral walls have cloven apart, forming on both sides very impressive ravines, several miles in length.

The most famous and magnificent of the two is known as the *Almannagjá*, or public rift. Its higher or western wall has an average height of from 80 to 100\* feet, and the lateral fractures are so even and regular that the various sections of the wall seem to have been laid in their places by the hands of some northern Anaks.

The old lava-stream, now thinly draped with a coarse herbage, and a ragged, dwarfed forest, has nothing in common with the lava rivers of the south; there is no fierce commotion here; no suggestion of a confined, chafing flood, in the moment of its uttermost wrath, instantly frozen by the fiat of omnipotence; but a broad, low, tranquil upheaval, resembling the calm, vast breathing of the ocean, when in repose.

Leaving the historic Thingfields behind, we traversed *Kaldi-dalr*, the cold valley, where glacier-hooded volcanoes closely confine the path, a narrow desolate pass, that forms, as it were, an entrance-aisle to the high central desert. And now we are on the borders of this desert, where nothing grows, the broad volcanic plateau, that, in an irregular ellipse, occupies the whole centre of Iceland. Huge blocks and fragments of lava are strewn all about us, at first suggesting ruins of some prehistoric, cyclopean structures. To these succeed smaller fragments, about the size and form of paving-stones, and then only a coarse, heavy sand. As far as

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\* Preyer and Zirkel (*Reise nach Island*) give height as in places far more than 100 feet, in others from 30 to 40.

the eye can send forth its messengers, only vast undulations of sand. Not far away, out of the sand-plateau, rises a ridge, dun, smoke-colored, with patches of begrimed snow or ice, lurking in its hollowed crests or lateral ravines. We do not wonder at the folk credulousness that has peopled this uncanny region with a race of mysterious outlaws. A desert were drear enough, but a desert out of which rise volcanoes, or ridges of volcanic ejections, and that combines with the sombre hues and influence of a chilled furnace the icy gloom of an arctic region, is repellent enough to every life throb, to awaken a sentiment of almost shrinking fear. As night comes on, the desert still stretches before us limitless, and the fog shrouds in ghostly robes the dead hills and mountains. At nine o'clock the moon rises, and casts a weird, chilling light over the landscape.

The dun volumes of fog press close upon her, seeking to dull her beams in sombre whirls of smoke, and, bolder grown, dare once and again to thrust a fog-shield between her face and the earth. The moon's struggle is a futile one, the fog-hosts are too densely marshalled.

Yet another and another fog-shield is thrust before the moon, and the circle of her influence is constantly lessened. At last we see her no more, and now, in troops, the fog goes hurrying past and descends ever lower, closer upon the earth. We are their lawful prey, for night has overtaken us upon the desert. We feel their chill, moist touch upon our cheeks, and cannot see our free horses running on before. But merrily we sing, and swinging the Icelandic whip, with loud halloos, urge our ponies ever onward. Indian fashion, we hang almost over their sides, seeking to gather up, as it were,

the scant atoms of light and discover with their aid traces of a hoof-mark.

And so, although we must pass the night, bivouacked within the fog realm, since we at last lose our way, we gain, nevertheless, a pasturage for our famished ponies, and by the next noon, can look back from the safe shelter of a farm house north of the plateau upon the region we have escaped.

The highlands are all shrouded in cloud and over their slopes hang and drift fringes of fog, as though the spirits of the mountains were still watching us, loth to admit their final defeat.

Were an hour infinitely expansible we might continue, yet for a long time, our Icelandic rambles.

But, if we arrest the pendulum, the sun unresting will mock at our impotent efforts in self-deception. Quickly then, that, at least in glimpses, a few scenes may still pass before us. Place yourself at your good pleasure almost anywhere in western Iceland, and, if the summer day be fine, the air will be as invigorating as in our crisp autumn days—the sky as clear as that of the high Alps. Hills near or far, never very remote, will bound the horizon, and, very probably, the truncated, conical forms of one or more will suggest their volcanic nature. Fragments of old lava, pierced with holes as if worm-eaten, will lie within sight, if not within hand-reach.

Perhaps a grassy meadow will stretch away from you and, at its farther end, a white or weather-blackened farm-stead or church rise.

An eagle or hawk may be floating mid-air, while, from projecting boulders, the curlew and ptarmigan are watching your movements, or sidling across your path,

to lure you away from their haunts. At times, in more isolated ponds, you can witness a gracious, domestic scene from nature; the stately swans protecting their beloved cygnet, as they glide swiftly away, father and mother with the child between.

If you would listen to the roar of thronging waters, many a river of Iceland, emerging from the melting snow-banks and glaciers of the highlands, must move in rapid course and in bold plunge before it can gain the placid level of the sea-plains. And where the volumed, sonorous waters descend in massive, blue, translucent curves, or white, foaming, rainbow-tinted, broken columns, far from human abode, with no sight or sound of tree or bird to call your thoughts away, you can converse with the presence that speaks to you from the waterfall. And, from the spray-bathed, crumbling cliffs, or amidst the green spires, carpeting the ledge that overlooks the caldron, you can gather one and another of the fairest, most delicately-petalled and hued of northern flowers.

If you would visit Hekla, wait at its base until every cloud has slunk away below the horizon and the wind is stilled, or clouds and sand storms will obscure the view, and all you will have for your pains will be the impressions and weariness of an arduous climb and a dim, fleeting picture of craters, filled with snow and walled with grey, yellow and purple-tinted accumulations of ashes, sand and slag.

The geysers are but one group, the principal one, of the manifold hot springs that escape the earth in all parts of Iceland.

Their force is becoming, however, gradually spent; an eruption of the Great Geyser does not occur oftener now

than once in ten days, and only a persistent traveller would remain tented upon that barren spot longer than forty-eight hours. Hence that display is rarely witnessed by visitors.

We have returned to Reykjavik, and are steaming away with the *Laura*.

As we bid good-bye to Iceland, a low, trembling arch of light spans the night-sky.

The Aurora-Borealis will soon span this northern firmament with many an arch of greater brilliancy, and there will be war in heaven and hosts of invisible warriors, with glittering lances, move to and fro, and the west be suffused with blood or all ablaze, as when Surtr, the god of fire, shall cross the divine bridge to destroy Valhalla and the elder gods in Rágnarök, but we shall be far away, beneath duller skies, but within more congenial, more generous surroundings.

Before the prow turns finally southward, we skirt the coast and touch at one of the eastern ports, Seyðisfjörður. The character of the water ways and of their guardian mountains has changed; not broad-mouthed fjords as in the west and north, but long, narrow, winding channels indent the coast, recalling in a measure those of the Faroe Islands.

The mountains too, rise more precipitously from the sea and in magnificent strata, poised one upon the other like a series of tables, or a giant-stair.

There are no indications here of recent volcanic action; the mountains are compact and iron-hued, not loose heaps of volcanic products, such as we have often seen in the west and centre. As we weigh anchor and the shores recede, some Icelandic students, on their way to

Copenhagen, shout their affectionate and proud farewell  
in the national anthem :

Oh, Iceland, fire's twin-birth,  
Belovéd foster earth,  
Fair mountain queen ;  
Thy sons shall cherish thee,  
While land is girt by sea ;  
Man to maid bendeth knee,  
Sun giveth sheen !

Over the swaying stretches of the North Atlantic, colder, more cheerless, more storm-roused than a three-month since, away to the Faroe Islands again. And one evening, while our boat, sheltered behind the curving shore of a bold headland, waits for the fog to lift, the Faroese peasants on deck join hands and, in a circle, begin their national dance. In slow measure of step and voice, the dance and chant proceed.

It is only a slower, heavier merry-go-round, such as we remember from our boyhood. The words are unintelligible, all save the refrain accompanying each verse, and the Icelanders on board are in equal ignorance. But a Faroese interprets ; 'tis some old folk-tale, transmitted in oral strophes from a remote past. As the song proceeds, the motion becomes more energetic, more varied ; the women remain, however, only solemnly stepping participants.

And, with the fog veiling all of the Faroese mountains, save their base, trailing along the bay and diffusing through the atmosphere as intangible rain, the weird chant draws to its end and, for the last time, we hear that "Guthmundr raedr hvar vith drekkum naesta Jól : " Gudmund decides where we shall drink our next Yule-horn.

## SOME NOTES ON THE UPPER AMAZON.

BY

COURTENAY DE KALB.

The following extracts from my notes, collected during a journey which I made up the river Amazon in the winter of 1889-90, having special reference to the geography of the region, are submitted with the hope that they may prove of value by adding some new facts, and also by serving to correct a few cartographical errors which came within my observation.

1. TOWNS.—A. Towns which no longer exist, but are still represented on maps.

CHIRRHUI ; abandoned in 1876.

SAN IGNACIO ; obliterated many years ago.

BORJA ; destroyed by the Indians about 1825 ; partially rebuilt by some Christianized Indians a few years later ; finally abandoned in 1854 or 1855. There is not even a trace of a house remaining, and the forest has completely overgrown the site of the ancient pueblo.

SANTIAGO ; This town, which was on the west side of the eastern cordillera of the Andes, was destroyed at the same time as Borja, and has never been rebuilt.

These two latter towns, together with Limon and others, formed a series of military posts to keep open communication with the towns in the valley stretching northward from the Amazon between the eastern and western cordilleras, *i. e.*, the valley of the Santiago,



where the Spaniards are said to have maintained extensive gold washings.

B. Towns recently built, and not shown on the maps.

ISLANDIA ; on the Peruvian bank of the Rio Javary, four miles from the Amazon.

POMBAL ; on the Peruvian side of the same river, two miles farther up.

CONCEIÇÃO ; on the Brazilian side of the Javary, thirty miles above Pombal.

NAZARETO MORÃO ; on Brazilian territory, at the junction of the Rio Javary and the Rio Itacoahy (wrongly named Tecuachy by Stieler), ten miles above Conceição.

SANTA CRUZ ; four miles farther up, on the Peruvian side of the river.

TRINIDADE ; on the Brazilian bank of the Javary, fifteen miles farther on.

NATIVIDADE ; also on the Brazilian side, three miles beyond Trinidad. These towns on the Rio Javary have grown with great rapidity, owing to the abundance of rubber in the forests of this locality. The population along the Javary and its important tributary, the Itacoahy, has become so large that the regular monthly steamers from Pará to Iquitos always turn aside to land and receive cargo from the ports above mentioned.

SAN ENRIQUE ; on the east bank of the Rio Huallaga, about sixty miles from its mouth.

SAN ISIDRO ; on the north bank of the Amazon, about a half mile east of the Island del Baradero. San Isidro was named in honor of the patron saint of Peruvian agriculture, and must not be confounded with San Isidoro.

PIEDRA LISA; on the north side of the Amazon, about one mile west of the embouchure of the Rio Pastassa.

SHAPÁJA; about four miles west of San Antonio, on the south bank of the Amazon. It is named after a palm, bearing a large edible nut, which grows very abundantly on the "Alto Marañon," as that part of the Amazon west of the junction with the Rio Huallaga is locally termed.

CARAVANCHÉL; on the north side of the Amazon, about five miles west of Shapája.

PARINÁRI; formerly did exist, as the maps show, on the south side of the Amazon, but was destroyed by fire several years ago, and has been rebuilt, a mile or more to the westward on the opposite, or north, shore.



## 2. RIVERS AND ISLANDS.

ISLA DEL BARADERO; this large island is usually represented as dividing the current of the Amazon just below the mouth of the Rio Pastassa, and as having the main channel on the north side. This is wrong. The

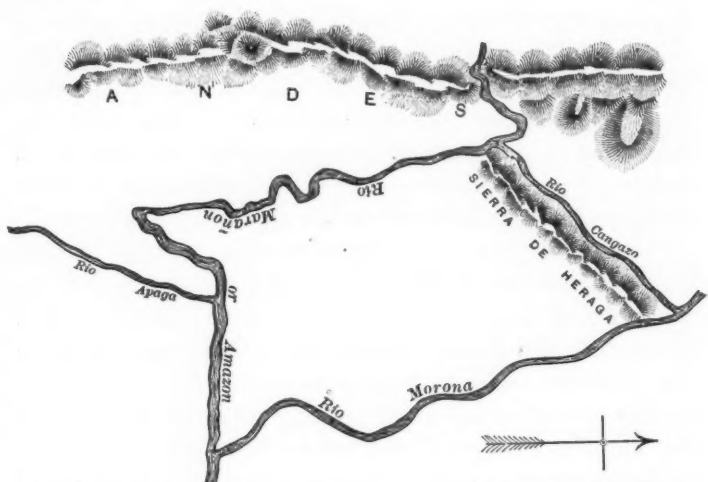
entire tide of the Amazon flows in an enormous bend on the south side of the island, while the channel on the north side is one of those canals, or "canoe paths," so common in the Valley of the Amazon, this one beginning in the Rio Pastassa a mile from its mouth, and leading by a very circuitous route of ten miles in length into the Amazon, just above San Isidro. The name of Baradero is obsolescent, being entirely unknown to all but a few of the oldest inhabitants. The current name for the island is LLUICHÚ, which signifies "a deer."

RIO AICHI-YACU; usually shown as a large stream flowing into the Amazon from the south, a few miles west of Barranca. This river should be called the Rio Potro, to which the Aichi-Yacu is tributary, being in fact the west branch of the Potro.

RIO APAGA; instead of uniting with the Amazon at the elbow of the great southward bend west of the Rio Morona, empties into it immediately to the eastward of the bend, as shown in the accompanying cut.

RIO CANGAZO; this river has never, to my knowledge, been noticed by any geographers. Within a few miles of the Andes the Amazon swings off toward the north, and then returns in a south-westerly course to the cataract, or PONGO DE MANSERICHE. Near the northern limit of this bend begins a wide canal, or "canoe path," which extends in a north-easterly direction to the Rio Morona. Along the north-west side of the triangular island thus formed extends a remarkably level ridge entirely disconnected from the Andean system. This ridge is called the SIERRA DE HERAGA. The Indians who annually cross over from the valley of the Santiago utilize it as a convenient overland route to the excellent

fishing grounds along the middle reaches of the Rio Morona, and hence there is a well-defined path along its summit.



RIOS PINCHES AND CHIPANGA ; these rivers, the former represented as flowing eastwardly into the Rio Pastassa, and the latter westwardly into the Rio Morona, are entirely unknown to all classes in this region, but the Indians say that at the place where I supposed the Rios Pinches and Chipanga should be found, is a "quebrada," or canoe path, called CHUINDRE, connecting the Pastassa and Morona. In the course of Quebrada Chuindre is said to be a large lake, rather nearer the Pastassa than the Morona, called LAGO RIMACHI.

I was also unable to find any one who had ever heard of the Rio Apianga, represented on the maps as an affluent of the Morona, and the best informed Indians persisted in affirming that it did not exist.

## GEOGRAPHICAL NOTES.

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THE NEXT INTERNATIONAL GEOGRAPHICAL CONGRESS.—By unanimous resolution of the delegates to the International Geographical Congress of 1889, the Paris Geographical Society was requested to choose the time and place for the next meeting.

Societies throughout the world were invited to send in propositions.

The Berne Society was among the first to respond, with an offer to take upon itself the charge of the International Congress for the year 1891. This offer has been accepted, and the Congress will therefore assemble at Berne in the first days of next August.

The wisdom of the choice is not to be doubted, though it may be regretted, in view of historical associations, that the preference was not given to Genoa, and the year 1892.

THE LIBRATION OF THE EARTH.—A note by Dr. Supan, in *Petermanns Mittheilungen*, Bd. 36, v., calls attention to the fluctuations of the earth's axis. Variations in the latitude of places had frequently been noticed, but it was supposed, naturally enough, that these might be due to defective instruments, or to errors of observation, and it was only at the end of the year 1889 that systematic measurements, made at Berlin, Potsdam, Prague and Strassburg referred the variations to their true cause. Prof. Hel-

mert says, in No. 2963 of the *Astronomische Nachrichten*, that the latitudes of Berlin and Potsdam, which had shown no clearly appreciable change in the first six months, varied during the third quarter of the year, increasing at first, and afterwards diminishing, as much as from 5" to 6". The movement continued through the next quarter and reached its end in January, 1890. There is no room for doubt as to the results of the observations at Berlin, Potsdam and Prague, the discrepancy being less than the tenth part of a second.

This question will be brought before the Commission for International Geodesy, which is to meet at Freiburg, Baden, in September of the present year.

THE EXPLORER'S DIFFICULTIES.—M. Antoine d'Abbadie, in laying before the Paris Geographical Society recently his work on the geography of Ethiopia (see *Compte Rendu* 1890, No. 11, p. 377), mentioned some of the obstacles in the way of the traveller, who wishes to bear true testimony.

Part of his mapping of Ethiopia was made by rapid triangulation. In default of this method, the explorer, noting his rate of travel and the time occupied, tries to get his bearings by the compass, measuring its declination at each place (a thing seldom done), or accepting a supposed uniform declination for a whole region. Too often he finds himself obliged to bring the record of his march into agreement with his occasional observations of latitude or, more rarely, with those of longitude; a matter which ought to receive more attention, since it is dangerous to rely upon the chronometer.

It should never be forgotten that, while the indica-

tions of the compass have a certain value, all the precautions of the observer will not protect it from local attraction.

The continual delays and the forced stops due to the failure of health, to wars between tribes, and even to local prejudices, are the stumbling-block of the traveller.

At such times he tries to inform himself concerning the regions he may not hope to visit, and he gathers orally information that is either imperfect or, too often, contradictory.

"This," says M. d'Abbadie, "is the subject of my book. Those who look through it will see that a little method may be introduced even into this geography by hearsay. For example, the distance from Gondar to Inarya was given to me by a native, intelligent enough to estimate each of the stages by comparing them with distances, which we had both passed over. Men who describe in this way are uncommon; the great majority take for a unit of distance the day's march, which is a vague designation, even when it is defined as with, or without, pack-animals, and difficult to compute exactly in taking the mean of large areas, for the alternations of higher and lower ground hardly permit us to deduce from them the horizontal distances, so dear to the compilers of maps. Points of the compass are got at by asking what country lies towards the rising, or the setting, sun. A Mussulman, obliged to know towards what part of the horizon he must bend when he prays, will generally tell the name of the nearest region; but not always, for the Islamism of the Ethiopian is often weak enough, and I have passed whole months with Mohammedans without having once seen them pray."



It might be supposed that the direction of a river would be learned by the answer to the question : "When you crossed this stream, did it flow to the right, or to the left?" On the contrary, most Ethiopians replied that the water flowed toward the low ground.

The character of the information varied with the class to which the native belonged ; the chiefs, who are the most intelligent, giving the clearest answers, though it was difficult to question them without exciting their suspicion, and it was dangerous to *write down the country*, as it was called, even in the presence of the ordinary native travellers. It was necessary to keep in mind whatever was said that seemed to be important, and to wait for an opportunity to put it down upon paper. Not much was to be got from traders, for they were afraid of showing the way to their competitors, and the best information seems to be that given by the young slaves, or by the messengers of the petty kings ; but it is not well to reward the one that gives it, for the money tempts him to invent his news in order to increase his gains. The most trustworthy stories are those that come spontaneously ; and M. d'Abbadie's practice was to begin the conversation on subjects that interested the Ethiopian, and to bring in his geographical questions by the way.

MERCATOR'S GLOBES AND MAPS.—Dr. Van Raemdonck,\* of St. Nicolas (Waas), in Belgium, has done much within the last twenty years, to renew the inter-

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\* The labors of this scholar form the basis of a paper on GERARD MERCATOR : HIS LIFE AND WORKS, by Mr. Elial F. Hall, in the JOURNAL of this Society, Vol. X., pp. 163-196.

est in Mercator and his work, and to dissipate, for a time, the darkness, which inevitably settles, at last, upon every distinguished name.\*

With full acknowledgment of his indebtedness to Dr. Van Raemdonck Professor Fiorini, of the University of Bologna, has just brought out a pamphlet, *Gerardo Mercatore e le sue Carte Geografiche*, originally published in the *Bollettino* of the Italian Geographical Society, for January-April, 1890.

Professor Fiorini has made a critical study of the Flemish geographer, as well as of the literature devoted to him, and appreciates his merit in these words :

"He was thoroughly versed in historical geography, as appears in the Atlas and in the great Map of 1569. Some of the inscriptions in the latter are true monographs of historical geography, such as the third and last part of the legend in which he explains what parts of the world were known to the ancients, in order that, as he says, the honor justly due may be rendered to the past ages; and also the inscriptions, *On Prester John, of Asia, and the first origin of the Tartars, That the Niger flows into the Nile, and On the Real Position of the Ganges and the Golden Chersonese.*

"He had a clear conception of political geography, and he neglects neither the natural history nor the ethnography of the various regions; and he paid close attention to physical geography; but it is in mathematical geography, above all, that he commands the

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\*An eminent American geographer had, but a few years ago, this experience: He mentioned, in conversation with a foreign admiral, something that had been done by Mercator. "Done by Mercator?" said the admiral. "Do you mean to say there was a man called Mercator? I have always thought that was only a name for the projection."

greatest admiration, a science that his labors advanced from a state of infancy to one of maturity."

The globes manufactured by Mercator are, naturally, very much more rare than copies of his maps. The gores of two globes (of 1541 and 1551) were reproduced in fac-simile in 1875 from the originals in the Royal Library of Brussels; and Professor Fiorini gives in an Appendix, on p. 81, a list of the existing Mercator globes, all in pairs (terrestrial and celestial): One pair in the Grand ducal Library at Weimar; one in the Imperial Library at Vienna; one in the Astronomical Museum of the Paris Observatory; One in the Library of the Cercle Archéologique at St. Nicolas (Waas); one in the Library of Nuremberg; and one at Cremona, in the Library.

To these Professor Fiorini adds, in an article published in the *Bollettino* of the Italian Geographical Society, for June, yet another pair, recently discovered in the Library of Urbana (formerly Castel Durante) in the Marches; and one, also, in Austria.

A pamphlet of 40 pages, *I Due Rarissimi Globi di Mercatore*, published by Mr. G. Buonanno, librarian of the Cremona Library, describes the globes mentioned by Professor Fiorini.

They correspond, point by point, with one or two exceptions, with the details given by Dr. Van Raemdonck in his account of Mercator's globes.

The supports and the horizons of the Cremona globes are the work of a later time, but the horizons are meant to imitate the originals.

The globes are about 4 feet 3 inches in circumference; the number of gores is twelve, and the in-

scriptions are in Latin and Flemish. The terrestrial globe bears the date of 1541\*; the celestial that of 1551.

Mr. Buonanno, who has held his position in the Cremona Library for only four years, has been unable to find in the records any mention of the globes but these few words in an inventory, made in 1872: "Two wooden globes for the study of Geography." He found, however, on the lower surface of each globe, Roman numerals similar in shape to those inscribed on some of the shelves, which were formerly in the Jesuit College at Cremona, founded in the beginning of the 17th century. He discovered that Cesare Speciano, Bishop of Cremona, and a man eminent for learning and culture, was sent to Germany as Nuncio in the year 1592; and there is nothing unreasonable in the conclusion that the Bishop acquired the globes in Germany, and brought them back with him to Cremona.

PILOT CHART FOR SEPTEMBER.—The U. S. Hydrographic Office reports in the Pilot Chart, issued Sept. 1st, a marked decrease in the number of icebergs off the Grand Banks, the Gulf of St. Lawrence being practically free of ice.

Attention is called to the fact that September is one of the worst hurricane months, and that the season lasts well toward the end of October.

The system of storm signals at Havana, during the

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\* The inscription is in broken lines, from top to bottom: Edebat Gerardus Mercator Rupel mundanus cum privilegio Ces (*sic*) Maiestatis ad an sex Lovanij an 1541.

hurricane season has been completed by the addition of the following night signals :

- A red light ..... Signs of bad weather.
- A red light over a white light..Decided indications of bad weather.
- (No night signal).....The port is closed.
- A white light over a red light..Indications of clearing weather.
- A white light.....Clearing weather.

The signals are shown (day and night) both at the office of the Captain of the Port, and at the Morro Semaphore Station.

The charts published in August, were: No. 1225, Laguna de Terminos, Western Entrance; No. 1226, Wide Opening, Exuma Sound; No. 1228, Laguna de Terminos, Puerto Real Entrance; and No. 549 *b.*, Seto Uchi, or Inland Sea, Japan, sheet II, extensively corrected.

THE MISSISSIPPI.—Mr. Alex. D. Anderson has written a "Descriptive, Commercial and Statistical Review of the Mississippi and Its Forty-four Tributaries," which has been printed by order of the U. S. Senate. This pamphlet presents within the compass of forty pages, illustrated by three diagrams, a striking picture of the great river and its importance to the nation. The drainage system of the river extends from Canada to the Gulf of Mexico, and from the summit of the Rocky Mountains to that of the Alleghanies; and from every part of this region, which embraces twenty-one States and the Indian Territory, the Mississippi can be reached by natural, or by artificial, waterways. These States furnished, according to the census of 1880, the following proportions of the products of the United States: Coal, 94 per cent., Pig-iron, 81 per cent., Corn

(maize), 89 per cent., Oats, 76 per cent., Wheat, 74 per cent., Hay, 60 per cent., Cotton, 68 per cent., Tobacco, 66 per cent., Sugar, 98 per cent., Wool, 56 per cent., Forest Products, 57 per cent., Swine, 82 per cent., Horses, 74 per cent., Mules, 77 per cent., Cattle, 73 per cent.

Their total product of grain was, in 1885, in bushels: Indian corn, 1,729,924,000; Oats, 514,100,000; Wheat, 241,722,000; Barley, 22,916,000; Rye, 15,464,000; Buckwheat, 5,655,000.

The alluvial lands of the Lower Mississippi, and its tributaries, subject to overflow by the rivers, cover an area of 41,193 square miles (26,363,520 acres). All but ten per cent. of these lands are susceptible of cultivation, and very fertile, but not more than 2,000,000 acres are cultivated, so great is the dread of the periodical inundations.

For protection against these, the Mississippi River Commission was appointed in 1879, "to take into consideration and mature such plan or plans as will correct, permanently locate, and deepen the channel, and protect the banks of the Mississippi River; improve and give safety and ease to the navigation thereof; prevent destructive floods; promote and facilitate commerce, trade, and the postal service." (*Act, Sect. 4*).

The Mississippi is the natural outlet for the trade of the United States with Mexico, Central and South America, and the West Indies, countries which now take from the Union but fifteen per cent. (\$64,090,000) of their foreign importations; and even of this proportion, less than one-sixtieth in value is shipped from New Orleans. Mr. Anderson's conclusion is that, with

the completion of works now in progress, there will come a vast development of the commerce with the nations to the south of the United States, and that this commerce must have its centre in the city of New Orleans.

THE OLYMPIC MOUNTAINS.—In December, 1889, the *Seattle Press* sent an exploring party to the mountain region lying between Puget Sound and the Pacific Ocean, and extending from the Strait of Juan de Fuca on the north to Lake Quinaiult on the south. The party returned early in the summer, and the notes of the explorers, with a number of portraits and views of scenery, and a large map of the Olympic Mountains, appeared in the *Seattle Press*, of July 16th. The map shows the country from  $47^{\circ} 20'$  to  $48^{\circ} 10'$ , N. Lat., and from  $123^{\circ}$  to  $123^{\circ} 40'$ , W. Long.

The Olympic Mountains are composed of several ranges, with a general direction from north-west to south-east, though the principal range, the Bailey, runs north and south; its highest point, Mount Olympus, being said to rise 8,550 feet above the sea. The four rivers, Elwha, Quinaiult, Queets and Quillayute, flow, not from Mount Olympus, but from Mount Seattle, a peak 7,700 feet in height.

The largest of the numerous valleys is the Quinaiult, which begins at Alexander River, and extends along the Quinaiult River and Lake in a southwesterly direction to the ocean. Lake Quinaiult, which is six or seven miles long and two miles wide, is wrongly represented on the United States Land Office maps. Instead of lying nearly north and south, with its outlet on the west-



ern side, the lake has a direction almost east and west, and the outlet is near the middle of the southern side.

All the country was well timbered, mostly with conifers.

The explorers named two valleys, six rivers, and thirty-nine mountains, in honour of various distinguished citizens. More deserved remembrance, but the mountains gave out.

U. S. GEOGRAPHICAL SURVEYS WEST OF THE ONE HUNDREDTH MERIDIAN, VOL. I, 1889.—This volume closes the record of the work done under the direction of Capt. Geo. M. Wheeler, Corps of Engineers, U. S. A., between the years 1869 and 1879. Captain Wheeler says, in a note added to his Letter of Transmittal: "This report, brought substantially to a close in June, 1879, was not presented for publication until 1887, from press of other duties and subsequent prolonged illness."

It contains, besides the Letter of Transmittal, and the Introduction; Five Chapters, treating, respectively, of the Areas Occupied, the Itinerary of the Colorado Grand Cañon, the Population, Industries, etc., the Indians, and the Land Classification; and Eight Appendices: A—List of Latitudes and Longitudes; B—Description of Atlas Sheet Maps; C—Formulated Methods, etc.; D—Notes on Survey and Disposal of Public Domain; E—Considerations upon National Government Surveys; F—Memoir upon Voyages, Discoveries, etc., to and at the West Coast of North America and the Interior of the United States west of the Mississippi, from 1500 to 1880; G—Synoptical Table of Contents of Quarto Volumes, etc.; H—Origin, Organization, etc., of Surveys

west of the One Hundredth Meridian. There are thirty-eight full-page Plates and three large Maps, and two Indices, one of subjects, the other of persons.

The portion of the United States territory west of the One Hundredth Meridian (excluding Alaska) covers 1,443,360 square miles. Of this area, the surveys accomplished under Captain Wheeler embraced 359,065 square miles, distributed as follows: In New Mexico, 80,052; in California, 64,906; in Nevada, 62,181; in Arizona, 61,876; in Utah, 38,969; in Colorado, 33,041; in Idaho, 8,877; in Oregon, 8,842; in Wyoming, 231; and in Texas, 150 square miles.

With regard to the cost of these Surveys, Captain Wheeler says, on p. 763:

"The cost for field and office work, including all expenses from the supply branches of the Army, with each and every expenditure chargeable to the work, was \$691,444.45. This sum has been reached after the most careful personal examination and much labor, and is an abstract from the actual vouchers of expenditure in all cases except the Quartermaster's Department, and is complete and final, notwithstanding any and all statements to the contrary from other sources."

The report, now finished, consists of seven volumes and a Supplement, one topographic and one geologic Atlas.

*Longmans' School Geography for North America.*  
*By George G. Chisholm, M. A., B. Sc., and C. H. Leete, B. A.* New York, 1890.

Mr. Chisholm says, in his preface to the English edition of his book, that "while he has sought to ex-

clude from the text-book almost all details which the pupils cannot be expected to keep permanently in mind, and can hardly attempt to keep in mind without doing injury in some way to their mental training, he has kept constantly before him the necessity for taking care that what the text-book does contain should be really foundational—should consist of what is most effective as discipline, most important to know." This excellent plan commended itself to Mr. Leete, who wrote for the present edition the portions on America in general, North America, and the United States.

The work has been well done. Accuracy of statement has been kept in view, facts are presented with conciseness and in interesting language, and no important subject has been overlooked. The illustrations are well selected, but the printing is not always up to the mark.

As it stands, the work is without a rival among School Geographies in America.

The authors have purposely omitted maps, and for these the pupil is sent to his atlas.

*Report of the Royal Commission on the Mineral Resources of Ontario, and Measures for their Development. Printed by Order of the Legislative Assembly.*

*Toronto, 1890.*

The Royal Commission on the Mineral Resources of Ontario, was appointed in May, 1888, and has done its work with commendable promptitude. The Province is more than twice as large as the State of New York. It has no beds of coal, but it contains deposits, some of them immensely rich, of nearly every other mineral,

iron, gold, silver, copper, lead, nickel, plumbago, arsenic, mica, zinc, granite, marble, freestone, etc. These resources, though by no means neglected, have yet to be developed; and this development must come, as the Commissioners think, by closer and freer commercial relations with the United States.

Already, more than half of the capital invested in the mines and mineral properties of the Province is held by Americans.

The shortest route of travel and traffic between the Eastern and the North-western States of the Union lies across the Province, but the checks imposed upon commerce have so far almost neutralized the advantages of this position. This idea recurs again and again in the Report of the Commission, and the measures for the development of the Province of Ontario are found to be, practically, but one, the removal or the modification of the restrictions to which trade is subjected by the U. S. Tariff regulations.

Statistical information abounds in the Report. Besides a detailed account of the geology of Ontario, there are tables of export and production, with rules for the determination of minerals, notes on charcoal and charcoal iron, and a summary of the mining laws of various countries, and the provisions for technical education. A glossary of geological and mining terms is added, and there is a good Index.

GEOGRAPHICAL EDUCATION AT OXFORD.—Mr. H. J. Mackinder, M. A., Reader in Geography at Oxford, reports, in the *Proceedings* of the Royal Geographical Society for July, the progress made during the year.

Forty-two lectures were delivered—twenty-one on the Historical, twenty-one on the Physical, Aspects of Geography. In the Historical course the regions dealt with were Europe, The Mediterranean, Western Asia, India, and North America. Five lectures dealing with the British Isles attracted an audience of 50 members of the University; but the average attendance was 20. There were also two or three lady-students, and a varying number of residents of Oxford.

The twenty-one lectures devoted to Physical Geography were regularly attended by four members of the University, and one or two lady-students. Mr. Mackinder had expected the extinction of this class, and is led to hope that it will live and grow.

Lectures were also delivered in other towns to large audiences, including several hundred teachers; and also at Rugby and University College Schools.

A SUNKEN CITY NEAR ROVIGNO.—Dr. Vincenz Hilber sends to the *Mittheilungen* of the Vienna Geographical Society (Band 33, No. 5 and 6) an abstract of a report, published in the *Transactions* of the Academy of Sciences, on the subject of a sunken city near Rovigno, in Istria.

Pliny the Elder mentions an Istrian island by the name of Cissa, and an extant letter speaks of the people of Cissa as an Istrian colony; and in the ecclesiastical records of the province of Aquileia for the years 579 and 679 occur the names of bishops of Cissa, in Istria.

Nothing more is known of the place, but some persons have been disposed to identify it with a spot to

the south of the island on which stands the lighthouse of Rovigno. At this spot the fishermen's nets are often entangled in masses of masonry and sometimes bring up fragments from the bottom of the sea; and some years ago a diver declared that he had seen walls and streets below the water. In January last an examination was made under official authority by a diver, sent down at a point marked by the intersection of two lines, one drawn from the tower of the Cathedral of Rovigno to the eastern end of the Scoglio San Giovanni in Pelago, the other from the Scoglio Bagnoli to the tower of Orsera. The depth of water was 85 feet.

"When I reached the bottom" says the diver, in his report, "I found myself surrounded by ruined walls, and was convinced, when I examined them, that they were the work of man, for, as a builder by profession, I recognized the layers of mortar.

"Continuing the exploration, I made out the direction of the line of walls, and the disposition of streets, but I did not see any doors or window-openings, these being hidden by masses of sea-weed and by all kinds of incrustations. I traced this regular masonry for a distance of 100 feet, but could go no farther, because the diving-bag and the cord did not permit. What I saw satisfied me that there existed in that place the ruins of a once-inhabited town, which through some catastrophe had gone down into the sea."

L'EGYPTE ET LA GÉOGRAPHIE.—Under this title the Khedivial Geographical Society has just issued a work by its Secretary, Dr. Frederic Bonola Bey, on the explora-

tions accomplished in Egypt under the auspices of the dynasty of Mohammed Ali.

Originally prepared as a report to be laid before the International Congress held in Paris, in 1889, the work has been retouched, and augmented by a few notes and an appendix. As it stands, the record is honorable to the rulers of Egypt, and must be taken into account in passing judgment upon their history.

The lines of exploration were practically laid down by Mohammed Ali's plans for the extension of his dominion, and, whether under his authority or that of his successors, the agents were, necessarily, for the most part, Europeans or Americans. Dr. Bonola has classified the work of each reign, and summed up, in four pages, the Egyptian contributions to geographical knowledge. These are, in part :

The astronomical determination of positions in the Delta, on the Nile to the Albert Nyanza, in Nubia, Kordofan, Darfur, on the Red Sea, in Harrar and on the Blue Nile ;

Triangulations in the Delta, the Fayum and Kordofan ;

Measurement of a base line in the plain of the Pyramids ;

Ascertainment of levels in the Delta and the Fayum, and on the Isthmus of Suez ;

Astronomical and hypsometrical observations ;

Reconnoissances and explorations in Arabia, in the deserts of Egypt and Nubia, in the western oases, to the east and to the west of the Nile, and along the river to the Victoria Nyanza, in Kordofan and Darfur, in the Harrar and on the coasts of Somali-land ;



The topographical survey of the Nile from the Mediterranean to the Equator, and the mapping of all Egypt Proper and many of the provinces ;

Geological researches in every part of the country from the Blue Nile to Syria ;

The creation of three cities,—Port-Saïd, Ismaïlia and Khartum,—vast improvements at Alexandria and at Suez, the establishment of light-houses on the Mediterranean and the Red Seas, and the building of railroads ;

The establishment of a postal and telegraphic service between Egypt and the Sudan.

Dr. Bonola notes the interesting fact that the last official dispatch received from the post-office at Khartum bore the date of November 4, 1884.

The Egyptian railroads have now, it appears, a total length of 1,194 miles.

*Ethiopie Méridionale. Journal de Mon Voyage aux Pays Amhara, Oromo et Sidama, Septembre, 1885, à Novembre, 1888., par Jules Borelli.*

4°, Paris 1890.

M. Borelli left Egypt on the 16th of September, 1885, and landed at Tadjurah, on the Gulf of Aden, January 1, 1886, having been delayed by the influence of the English agent at Zeilah. He reached Farré, the first town of Shoa in approaching from the east, in June. He stayed ten months in Shoa, tolerated by the king, Menelek, who was not pleased to see him. After a short visit to Harrar he returned to Antoto, Menelek's residence, and made preparations for his journey to the south. Starting in November, 1887, he climbed several

lofty mountains—Dendy, Harro, May-Goudo—and from Ali-Dhéra, where he found on the very summit Mussulman graves turned towards Mecca, traced the course of the Djimma Ghébié and the Omo rivers to their confluence. He found the Abbala lake, first indicated by M. d'Abbadie, who had never seen it.

M. Borelli's farthest point to the south was Mt. Bobbé, in  $6^{\circ} 30'$  N. Lat. Here he was stopped by the hostility of the natives, and returned in the direction of Antoto. On the way he endeavored to penetrate into the Zingero country, but barely escaped with his life from a furious assault upon his party. From Antoto he returned to the coast.

Throughout his journey he registered observations with his instruments, took photographs, mapped the regions traversed, studied the races, and wrote out vocabularies of languages.

His collections, mostly ethnographical, have been presented to the French Government.

The divisions and subdivisions of races in Ethiopia are, according to M. Borelli, hardly to be classed under any general name. There is not, in his opinion, any such thing as an Abyssinian, Dankali, Somali, Oromo, or Galla, race; though he is inclined to believe that all these have a common origin and that the primitive type may still be seen in some of the Oromo tribes. He observed that, wherever Islamism had penetrated, the type had degenerated. In some regions the mixture with negro blood was evident, while in others this was almost wholly wanting; and among the Zingero a decidedly Asiatic type of face was occasionally seen. The head of a young Hadia girl, engraved on page 337, would be

taken anywhere for the copy of a portrait from an Egyptian temple.

M. Borelli finds not much to praise in the people of Ethiopia.

They are all given, more or less, to lying and gluttony and thievery and exceeding dirt. The king of Djimma, being asked how it was that his subjects had contracted the habit of lying, answered: "I can't tell you why, but so it is. Our fathers always told lies, from time immemorial, and we lie, and our descendants, when their turn comes, will tell lies."

M. Borelli was at Antoto, king Menelek's residence, on the occasion of a religious festival that lasted five days. The king entered the city at the head of a procession. Cannon were fired, and the soldiers discharged their loaded muskets. The streets were crowded with priests in bright-colored robes, and wearing, some of them, gilded or silver head-dresses. They were all tipsy, and sang as they reeled along.

The king gave a dinner to a thousand persons, who sat in tents. After this he came out and had a monster feast, prepared for four thousand men. Great troughs, made of trunks of trees, were filled from time to time with drink, and the soldiers quenched their thirst like horses. When they were no longer able to stand, they were dragged out of the enclosure. To mark the religious character of the festival, the priests eat and drank more than the others. Six hundred cattle were killed for one day's repast.

The Omo River, which was traced through a great part of its course, flows first towards the north, then curves and flows south-east and south, then to the west-

ward and finally to the south, and enters Lake Shambara or Samburu, in E. long.  $35^{\circ} 35' 22''$ . This lake lies beyond M. Borelli's farthest point to the south, but he identifies it with the Basso-Narok, discovered by Count Teleki and Lieutenant von Höhnelt, and by them named Lake Rudolf; and these gentlemen, with whom M. Borelli compared notes at Cairo, seem to have accepted the identification.

In the *Journal* the entries are printed as they originally stood, each under its date; an arrangement less satisfactory to the reader than the division into chapters. Even with this drawback, the book has the greatest value as a contribution to the knowledge of Abyssinian geography and ethnology.

Of the typography and the maps and the numerous illustrations, it is enough to say that they are in the style of Quantin's publications.\*

CASATI'S EXPLORATIONS.—Under this heading Capt. Antonio Cecchi writes to Prof. G. Dalla Vedova from Aden, on the 30th April, a letter, which appears in the *Bollettino* of the Italian Geographical Society for May. The letter covers, including a table of itineraries and notes, only six pages, and sets forth from Casati's own memoranda some of the work that he accomplished during his ten years' stay in Equatorial Africa. It was Casati who first informed Emin of the existence of the snowy mountains, now familiar to all as the Ruwenzori range. In one of his letters, written from Uhaiya, Unyoro, on the 1st of April, 1887, Casati describes these mountains,

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\* The imprint is: Paris, Ancienne Maison Quantin, Librairies-Imprimeries Réunies, May & Motteroz, Directeurs, 1890.

under the name of Varimcampanga, as situated to the north-east of Lake Ruitan (Albert Edward) and as inhabited by people of the Wakonju stock, light-colored, and speaking a tongue of their own; and he makes the distance from Uhaiya to Lake Ruitan, twenty days' march. The Ruitan-Nzige (the form *Muta-Nzige* is declared to be erroneous) is, according to Casati, incorrectly laid down on the maps. The northern extremity extends but a few miles beyond the equator. This fact was established by astronomical determination of latitudes. It was found, also, that the outlet of the lake, the Semliki River, flowed first to the north-west, described an ample curve, with its convexity to the west, and entered the Albert Nyanza at its southern extremity. The bed of the Semliki (it is not stated at what point) was 2,182 feet above the level of the sea.

From Muchora, a village in the country of Ukonju, at an elevation of 3,700 feet, the loftiest peak of the Ruwenzori, covered with snow, was seen towards the north-east, and to the southward lay the great tableland, extending as far at the Ruitan-Nzige. From Muchora a pass led over the foothills of the Ruwenzori, at a height of 5,174 feet, into the country of Usongoro.

Casati assigns to a place, to which he gives the name of Niamogogiò, situated in the the territory of Uzinza, a position distant only about 1,300 feet from the Victoria Nyanza; and Captain Cecchi observes: "From this it clearly appears that the Victoria Lake, as it is marked in the recent map of Perthes, is not exact. It should undergo a displacement in its southern portion, and pre-

cisely in a south-south-west direction, of at least 120 kilometres (74 miles)."

This corroborates Stanley's rectification of his own surveys, and leaves the true extension of the Victoria Nyanza a yet unknown quantity.

As long ago as October, 1881, Casati succeeded in finding the grave of Miani, and collected his bones and a pipe, which had belonged to him, with the purpose of removing them to Italy for burial. These precious relics, and all his own notes, were taken from Casati when he was held a prisoner by Kabba Rega, the King of Unyoro; but he still possesses, it must be hoped, the record of his six years' companionship with Emin, and will tell the story to the world. The very qualities of modesty and single-heartedness, which have kept him in the background, will give authority to his utterance.

CARTOGRAPHY OF PORTUGUESE AFRICA.—The Portuguese Government continues the systematic survey of its African possessions and publishes the results in maps and charts, always on an ample scale, and executed in a style that does credit to the Comissão de Cartographia. Recent issues are:

Carta da Ilha de S. Thiago (Cabo Verde).

Plano Hydrographico da Bahia do Tarrafal (Ilha de S. Thiago).

Plano Hydrographico do Fajão d'Agua, Ilha Brava (Cabo Verde).

Reconhecimento Hydrographico da Foz do Pungue (Prov. de Moçambique).

THE UPPER IRAWADI.—*Nature*, of July 31, takes

from the Allahabad *Pioneer* the report of an attempt to explore the upper course of the Irawadi.

This river is formed by two streams, the Mali Kha from the north and the Meh Kha from the east, which come together a little below lat.  $26^{\circ}$ . The sources of the Mali Kha were known already to be to the east of the Brahmakund, but the Meh Kha, supposed to be the larger and, perhaps, identical with the Lu River of Tibet, had never been seen by any European. On the 27th May, Captain Barwick, Mr. Shaw, and Major Fenton left Bhamo in the *Pathfinder*, a paddle-steamer of 35 tons, for the confluence of the two rivers. Above Maingua, up to which point the river is known, the Irawadi runs between mountains from 1,200 to 2,000 feet high. The rapids in this part of the voyage were numerous and very dangerous to the little steamer, but after six days the confluence was reached, at about 150 miles from Bhamo. The river was 500 yards wide, the Mali Kha branch trending to the north-eastward, the Nmaika (Meh Kha) to the eastward. The Mali Kha was ascended for six miles to a series of rapids, which were not attempted, there being but little fuel left. The position was fixed in lat.  $25^{\circ} 56' N.$ , and long.  $97^{\circ} 38' E.$

The Nmaika was also ascended, but only for three miles, to a rapid, which could not be passed.

THE RED RIVER ROUTE TO YÜNNAN.—According to the *Returns of Trade, Part II.*, for 1889, published by order of the Inspector-General of Customs, China, the French have the advantage in the competition for the trade of Yünnan.

The Report of the Commissioner at Mengtzu, in



Yünnan, mentions six trade routes leading into the province: five from the east and south, and one from Bhamo, in Burma. This last is neglected as a "problem of the future"; the others are described.

The first route is that from Hankow, a 40 days' over-land march, with heavy transit duties on goods. The second leaves the Yangtze above Hankow and passes by Yung-ning; a journey of 19 days by water and more than 20 by land, 39 in all.

The third and most important route for merchandise is by a land journey of 22 days from the Yangtze, above Hsü-chou-fu, and near the north-eastern frontier of Yünnan. The net amount of annual dues paid at the Barrier on this route, just within the boundary line, is reported at 240,000 Taels (\$276,000), of which 75,000 Taels are on opium and nearly the same number on salt.

The fourth route starts from Pakhoi, in the province of Kwang-Tung, at the head of the Gulf of Tonquin, and passes by Po-sê. The journey by this route is accomplished in 54 days. Po-sê is a great outlet for Yünnan and Kweichow opium, for the purchase of which 1,000,000 Taels in silver annually pass through the place. The tin of Yünnan is also sent from Po-sê to Pakhoi, and the Commissioner of Customs at this port estimates its trade with Yünnan in foreign cotton and woollen goods at 1,450,000 Taels, yearly. None the less, the opinion of the merchants at Po-sê was that, if frontier trade at Mengtzu succeeded, they would suffer; and many houses have already recalled their agents. This is the result of less than one year's competition with the French route.

The fifth route is the one through the French territory, *via* the Red River. The stages are : From Haiphong to Hanoi, by steam, 1 day ; Hanoi to Laokai, by junk, 20 days ; Laokai to Manhao, by junk, 7 days ; Manhao to Mengtzu, by pack-animals, 3 days ; and Mengtzu to Yünnan-fu, by pack-animals, 9 days. Besides the gain in time, the transit dues by this route are very light, and the French authorities aid the development of trade by their liberal measures. As to cost, the Commissioner reports that a box of 60 catties in weight (80 lbs.), half the load of a mule, can be delivered at Mengtzu, from Hong Kong, for 2.30 Taels ; while it costs about the same sum for mule hire alone from Po-sê.

Mengtzu is not merely a distributing point for boxes and bales ; it is an enchanted land, second only to Michigan or Utah. Who can read without emotion the words of the Commissioner ?

\* " Michigan's proud challenge to the world is, ' If you wish to see a beautiful peninsula, look around : ' with the change of one word, Mengtzu may with equal appropriateness venture such language with regard to her location. Built on a cultivated plateau, 20 miles long by 12 miles wide, level as a threshing floor, though 4,500 feet above the sea, she commands an unobstructed view of the mountains which encircle the plain. Though devoid of trees, such an important element in the charm of mountain scenery, the surrounding heights make up for their nakedness by the glow of the most beautiful shades of red and brown, purple and

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\* The State motto is : *Si quaeris peninsulam amoenam, circumspice* ; a travesty of the inscription on Sir Christopher Wren's tablet.

gold, made glorious in the clear atmosphere of this high altitude by the bright rays of an almost perpetual sunshine.

"In its location and environment, not forgetting the pretty lakes of clear water (although fresh) in the neighborhood, Mengtzu, on a smaller scale, may be compared with Salt Lake City, and almost compete with it in the charm of its picturesque situation."

PE-CHILI.—M. Romanet du Caillaud makes a communication to the Paris Geographical Society (*Compte Rendu*, 1890, No. 12 and 13, p. 357), on the subject of the names *Pé-Tchi-Ly* and *Nan-Tchi-Ly*. He says: "The imperial province of the Chinese Empire now bears the name of *Tchi-Ly*; it was formerly called *Pé-Tchi-Ly*, that is, the *Northern Tchi-Ly*. This supposes that there was formerly a *Nan-Tchi-Ly*, that is, a *Southern Tchi-Ly*; and, in fact, under the Ming dynasty (1368–1649), when Kiang-Ning-Foo (Nanking) was the Southern Court, the province of Kiang-Nan, of which Nanking is the chief city, was known as *Nan-Tchi-Ly*; and Chun-Thien-Fou (Peking) being then the Northern Court, its province was known as *Pé-Tchi-Ly*. Now that Chun-Thien-Fou (Peking) is the only imperial court, its province alone is called *Tchi-Ly*, and is, consequently, no longer to be distinguished by the addition of the prefix *Pé* (north)."

If not new, this is, for the most part, a correct statement of the case; but the conclusion may be questioned. Professor Egli agrees with M. Romanet du Caillaud: "Now, under the Manchu dynasty, which has but the one Capital, Pe King, there is only one *Tschy-Ly*, and

the *Pe-Tschy-Li*, corruptly written *Petscheli*, of our maps is antiquated."\*

Some German cartographers have adopted the form *Tschi-Li* for the name of the province, though they still write *Meerbusen*, or *Golf von Pe-ttschi-li*. With sounder judgment the editors of Stieler's Hand Atlas retain for the province, as well as for the gulf, Professor Egli's "antiquated" form.

The objection to the change is, that it has no significance for any people, except the Chinese; and European maps are made, not for the Chinese, but for Europeans. The principle of the reform, advocated by M. Romanet du Caillaud, and Professor Egli, involves the abolition of the names, *Peking* and *Nanking*, and the recasting of the whole map of China, beginning with the name of the Empire.

THE MORIORI.—In *The Transactions and Proceedings of the New Zealand Institute*, Vol. XXII., is a paper by Mr. Edward Tregear, on the Moriori, the original inhabitants of the Chatham Islands, which lie about 400 miles to the eastward of New Zealand. There are but twenty-seven of these people now alive, of pure descent, and five half-breeds; and the other inhabitants of the group of islands are about two hundred and fifty Maoris, and as many whites.

The Moriori are akin to the Maori in appearance, and in language, though somewhat shorter and broader

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\* Jetzt, unter der Mandschudynastie, welche nur die eine Hauptstadt Pe King hat, gibt es nur ein *Tschy-Li*, und ist das *Pe-Tschy-Li*, corruptirt *Petscheli*, unsrer Carten antiquirt.

(Nomina Geographica, *art.* Tschy Li.)

in person. They are remarkable for the size of their hooked noses.

They do not tattoo, and do not know the art; they appear to have had a regular marriage ceremony; and they dispose of the dead in a peculiar manner. If a man celebrated as a fisherman died, the body was lashed in a sitting posture to a canoe, and sent out to sea; if the dead man had been a bird-catcher, his body was fastened to a tree with the face turned towards the place he had most hunted over in life. The women ate apart from the men.

The ancient huts were either  $\Delta$ -shaped, or conical, and formed by bundles of poles tied together at the top. Children were baptized, with ceremonies accompanied by the planting of a tree, as in New Zealand.

In 1832, two Maori tribes made a raid upon the Chatham Islands, and took possession, treating the peaceable Moriori, literally, like sheep.

The Moriori traditions, justly described as extraordinary and valuable, if authentic, carry back their genealogy through 184 generations; or nearly 3,700 years, at twenty years to a generation. The roll begins with Rangi and Papa (Heaven and Earth). In the 157th generation when Rongopapa was living, canoes arrived in the islands from Hawaiki, or Hawaii. The old chief Tapu, now living, affirmed that his people were the original children of the soil, and that the canoes mentioned were the first arrivals from Hawaiki. Mr. Tregear, however, thinks it evident from their vocabulary and songs, and their genealogy, that the Moriori came from the same far-off Hawaiki. He gives

the old names of the months, all names of persons, and unlike the Maori words. One sound in these names, written *tch*, is only met with elsewhere, in Tonga, and the other Friendly Islands.

There are legends of an enormous bird which once existed on the largest island. The name given to it, *Poua*, almost identifies it with the mythical gigantic man-eating bird *Pouakai*, of the South Island of New Zealand.

The home of this little people is the island of Rekohu.

AUSTRALIAN PLANTS.—Baron Ferdinand von Mueller, Government Botanist for the Colony of Victoria, has just brought out, "The second Systematic Census of Australian Plants, with Chronologic, Literary and Geographic Annotations; PART I.—VASCULARES."

The plant-world of Australia is Baron von Mueller's acknowledged domain.

He dedicates the book in these words :

TO

SIR JOSEPH HOOKER, K.C.S.I., C.B., F.R.S., V.P.L.S.

AND TO

M. ALPHONSE DE CANDOLLE, F.M.R.S., F.M.L.S.,

WHO AS HEIRS OF GREAT NAMES WORTHILY SUSTAIN WORLD-WIDE ANCESTRAL FAME,

AND WHO AS LEADERS IN PHYTOGRAPHY DURING HALF A CENTURY WILL BE PRE-EMINENT IN BIOMORPHIC SCIENCE THROUGH ALL AGES,

THESE PAGES

ARE OFFERED AS AN APPRECIATIVE TRIBUTE,  
FROM A YOUNG COLONY IN ANTIPODAL REMOTENESS.

TITLES OF PAPERS IN GEOGRAPHICAL JOURNALS.

EDINBURGH.—*The Scottish Geographical Magazine.*

The Emin Pasha Relief Expedition: Address to the Society. By Henry M. Stanley, Commanding the Expedition—A Voyage Inland from Canton. By Dr. W. G. Dickson—Proceedings of the Royal Scottish Geographical Society—Russian Laplanders. By V. Dingelstedt—“In Darkest Africa,” Reviewed by John Geddie, F.R.G.S.

GOTHA.—*Petermanns Mittheilungen.*

The Cloudiness of Central Europe (including the Carpathian countries)—Survey of Molo Strait (W. Coast of Flores, in Malay Archipelago)—The Calculation of Mass of Elevations and Depressions of the Earth's Surface—General A. von Tillo's Hypsometrical Map of European Russia—Dr. Suess's View of the Structural Features of East Africa—Involuntary Migrations in the Pacific Ocean—The Nicaragua Canal—The Distribution of Salt held in Solution in the North Atlantic Ocean—The New Boundaries in Africa—Dr. Lüddecke's Map of Africa (in 6 sheets)—Mangarai Strait (a correction of a statement in the article on the “Survey of Molo Strait”).

LISBON.—*Sociedade de Geographia, Boletim.*

Expedition to Portuguese Guinea, to fix the Boundary Line between the French and the Portuguese Territories. By E. J. da Costa Oliveira—Chorography of the Island of S. Thiago (Cape Verde)—Historical Notes on



the Peninsula of Arrabida (on the Bay of Setubal)—On the Conquest of the Mines of Monomotapa—The British Ultimatum. Communications sent and received by the Lisbon Geographical Society.

LONDON.—*Royal Geographical Society, Proceedings.*

The Annual Address on the Progress of Geography: 1889-90. By the Right Hon. Sir Mountstuart E. Grant Duff, G. C. S. I., President—Further Explorations in the Solomon Islands. By C. M. Woodford—Geographical Education: The Year's Progress at Oxford—Explorations in Cilicia Tracheia. By J. Theodore Bent—Obituary: Edward Colborne Baber—Anniversary Meeting—Geographical Dinner to Mr. H. M. Stanley.

MADRID.—*Sociedad Geográfica de Madrid, Boletín.*

The Material for the Teaching of Geography and its Rational Employment—Memorial Discourse on the Conde de Toreno, ex-President of the Geographical Society—Memorial Discourse on D. Hilario Nava y Caveda, ex-Vice-President of the Geographical Society—Report on the Progress of Geographical Work. By D. Martin Ferreiro, Secretary—Dr. Vicente de la Fuente, Member of the Society—Voyage of Circumnavigation Accomplished by the Ironclad *Numancia*, in 1865-67—Authentic Notices of the Famous River Marañón.

PARIS.—*Société de Géographie, Compte Rendu.*

The Dunes of the Sahara (Capt. A. Bernard)—Railway across the Sahara—Maps (the work

of M. G. Camus) showing the Accumulation and the Depth of the Snow in the Valleys of the Alai and the Pamír, in March and April, 1887—Geographical Congress at Montpellier—Dr. Catat's Scientific Mission in Madagascar—M. Dybowski's Report on his Scientific Mission to the Southern Portion of Algeria—Unification of Time—M. Garnier on the formation of the Dunes of the Sahara—M. Drapeyron's presentation of Works by M. Gabriel Marcel—M. Antoine d'Abbadie's *Géographie de l'Ethiopie*—Report on Casamanca and Fuñi (W. Africa) by Capt. Brosselard Faidherbe—Reception of M. Fernand Foureau, explorer of the Central Sahara.

*Bulletin.*

Report on the Work of the Society and on the Progress of Geography in 1889, by M. Charles Maunoir—Unification of Time. By W. de Nordling—The Scientific Cruise of the U. S. Schooner *Grampus* in 1889. By J. Thoulet.

ROME.—*Società Geografica Italiana, Bollettino.*

Explorations of Gaetano Casati—The Uaupes River and the Tribes of the Uaupes—On Italian Emigration and Colonization, especially in South America—Native Carvings in the Region of the Upper Orinoco—Lamberto Loria in New Guinea—Report of the Progress of the Work of the Columbian Commission—A Journey in South Africa—The Density of Population in Europe (noting the error in

the accepted belief that Belgium is the most densely populated country) — Mercator's Globes in Italy—The *Al Brasile* of Lomonaco.

VIENNA.—*Kais. Königl. Geographischen Gesellschaft, Mittheilungen der.*

Von Brenner-Felsach's Travels in the Independent Battak Country (Sumatra) and in the Island of Nias—Oscar Baumann's Map of the Middle Congo—The Last Glacial Period of the Central Alps to the North of the Brenner—Diver's Report on the Sunken City at Rovigno in Istria—An Excursion in the South-eastern Caucasus—The Former and the Present Highest Levels in Venice.

WASHINGTON.—*National Geographic Magazine.*

The Rivers of Northern New Jersey, with notes on the Classification of Rivers in General: William Morris Davis—A Critical Review of Bering's First Expedition, 1725-30, together with a translation of his original Report upon it: Dr. William H. Dall—Supplementary Note on the Alleged Observation of a Lunar Eclipse by Bering in 1728-29: Marcus Baker.

## WASHINGTON LETTER.

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WASHINGTON, SEPT. 23, 1890.

MARINE METEOROLOGY, etc.—The Pilot Chart of the North Atlantic Ocean for September, (issued by the Hydrographic Office, Navy Department) is, as usual, filled with information of importance to the navigator and of interest to every one. A feature of new and special interest is the publication on the chart itself of two small charts,\* with isothermal lines showing the mean surface temperature of the ocean between New York and the 40th meridian, north of the 40th parallel, for the first and second half of August. Very few realize the large number of reports that the Hydrographic Office receives from masters of vessels of every nationality, all of whom seem even more willing to help our Office than the corresponding offices of their own governments, on account (so they say) of the prompt and practical character of our publications. These surface temperature charts, for instance, were actually issued before the month of August had quite ended, and yet more than six hundred observations had been received in time to use in preparing the chart for the first half of the month, and about three hundred for the second. The special value of such prompt publication lies in the fact that the charts are of immediate use in transatlantic navigation, and not merely of scientific or historic value, as is generally the case in work of this kind.

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\*See Charts.

The navigator of an ocean steamship is very largely guided in his route by the surface temperature, inasmuch as warm water indicates in this region, the easterly Gulf Stream current, and cold water inshore, or the Labrador, current. The competition is so great that every hour counts, and the object is to try to cross the Grand Banks in such a latitude as to have some 20 or 24 knots of current per day *with* the vessel, instead of an equal amount *against* her. And this is not merely a question of making a good record, but a question of economy as well. A big twin-screw steamer burns about fifty dollars' worth of coal an hour, so that the difference in one day due to current may amount to \$150.

The record of the two charts shows, that the Gulf Stream had even surpassed its usual midsummer northern limit: the isotherm of 80° F. runs almost due east along the 41st parallel, from the 64th to the 40th meridian, while that of 60°, which may be assumed, roughly speaking, as the limit of the Labrador current, skirts the coast within about 100 miles all the way from Cape Cod to Cape Race, although it runs down along the eastern edge of the Banks in a long wedge-shaped projection. There the sudden change of the temperature is so marked that a navigator can actually determine his longitude by it, with greater accuracy than was possible with the best instruments before the days of the modern chronometer. It is in this cold wedge of Arctic current that icebergs linger far into the summer, and some are shown now on the chart, close to the edge of the Gulf Stream.

A buoy, whose position is plotted on the chart about 600 miles E. N. E. from Bermuda, under date of June

27, has a most interesting history. It has been identified as the iron canbuoy that went adrift from Port Royal, S. C., toward the end of November, 1886. Fortunately it was marked in such a way as to be easily identified, being painted in black and white vertical stripes, with the letters "P. R." in black on one of the white stripes. This buoy has been adrift for three years and seven months, and may be heard from again. It is in the western part of the Sargasso Sea, that region of light variable currents, between Bermuda and the Azores. This is probably the longest drift on record, so far as time is concerned, although distances traversed have been greater; the famous derelict American schooner *W. L. White*, for instance, wrecked and abandoned off Delaware Bay during the "March Blizzard" (1888), drifted over to the Scottish coast, and grounded on one of the Hebrides. Another famous and almost incredible case is that of the British ship *Ada Iredale*, an iron, coal-laden vessel. Abandoned on fire in the South Pacific, in October 1876, she drifted 2,400 miles westward and was towed into Tahiti still burning, in June 1877. She continued to burn till May 1878, when she was repaired, and, as a handsome bark named *Annie Johnston*, has done good service in the trade with China. Verily, "truth is always strange—stranger than fiction."

Captain Henry F. Picking has been relieved from duty as Hydrographer, Navy Department. Lieutenant Richardson is acting Hydrographer.

The Hydrographic Office has published an abstract of the Proceedings of the International Meteorologic Congress held in Paris, September 19-26, 1889.

Lieutenant Aaron Ward, naval attaché at the U. S.

Legation, Paris, who had been delegated by the Secretary of the Navy to represent the Hydrographic Office, presented to the Congress a series of maps and books published by the Hydrographic Office. Aside from a few remarks which he made on that occasion, there is a conspicuous absence in the "Proceedings" of any discussion by North American Meteorologists, or any allusion to their eminent services.

IRRIGATION.—In order to understand the status of the question concerning the irrigation of the arid regions of the United States, it will be necessary to review briefly proceedings in Congress on the subject during the present session.

In the bill making appropriations for sundry civil expenses of the Government for the fiscal year, ending June 30, 1891, the House of Representatives agreed to the following section :

"For the purpose of investigating the extent to which the arid region of the United States can be redeemed by irrigation and for the investigation of the sources of water to be used in irrigation, and the segregation of irrigable lands in such arid region, and for the selection of sites for reservoirs and other hydraulic works necessary for the storage and utilization of water for irrigation and for ascertaining the cost thereof, and the prevention of floods and overflows, and to make the necessary maps, including the pay of employes in the field and in office, the cost of all instruments, apparatus, and materials, and all other necessary expenses connected therewith, the work to be performed by the Geological Survey, under the direction of the Secretary of the Interior, *seven hundred and twenty thousand dollars.* . . .



For engraving of maps, including the pay of employés, the cost of apparatus, instruments, and materials, and all other necessary expenses connected therewith, *fifty thousand dollars.*"

When the subject was reached in the Senate it encountered determined and violent opposition, chiefly from Western Senators, although these were largely strengthened by others from all sections of the country, without political distinction. The debate, which extended over several days, developed a hatred for the whole scheme, based on the official interpretation or construction of a section of the Act of October 2, 1888, which provided that, "all land which may hereafter be designated or selected by the United States surveys for sites for reservoirs, ditches, or canals for irrigation purposes, and *all lands made susceptible of irrigation* by such reservoirs, ditches or canals, are from this time henceforth reserved from sale as the property of the United States, and shall not be subject after the passage of this act, to entry, settlement, or occupation until further provided by law." The Commissioner of the General Land Office in a circular to U. S. Registers and Receivers, after reciting the above section said: "The subject sought to be accomplished by the foregoing provision is unmistakable. The water sources and the arid lands that may be irrigated by the system of national irrigation are now reserved to be hereafter, when redeemed to agriculture, transferred to the people of the Territories, in which they are situated, for homesteads. The Act of Congress and common justice require that they should be faithfully preserved for these declared purposes. . . . Neither individuals nor corporations have a right to make filings

upon any lands thus reserved, nor can they be permitted to obtain control of the lakes and streams that are susceptible of uses for irrigating purposes. You will, therefore, immediately cancel all filings made since October 2, 1888, on such sites, . . . and you will hereafter receive no filings upon any such lands."

It was stated during the debate that under the above ruling an area of 1,350,000 square miles had been withdrawn absolutely, all entries for pre-emption, homestead, etc., having been suspended, resulting in hardships in delaying and in staying the progress of all that country. The former adherents of the scheme for irrigating the arid regions became its most bitter opponents, and some of them showered ridicule and contempt upon topographical surveys, and geological surveys, and nearly everybody connected with them. The Director was styled "a Tycoon with many tales." One member said that nothing needed a more thorough survey than the Geological Survey itself. Like Falstaff, it had grown out of all compass, and like Sir John, seemed to be not only "a falsifier itself, but a collaborator of untruths;"—"a magnificent fabric of fabrications:" That there was not money enough in the Treasury to pay for a "geological-topographical-paleontological-irrigation map of the United States. It was claimed that under a different construction of the law, only the identical lands that were to be covered with water were to be reserved; that a topographical survey of the whole region was wholly unnecessary, and that irrigation would not be benefited thereby, but that the settlement of the whole western country would be set back for the period of a generation. Said Senator Stewart: "Inasmuch as we

have failed to get reservoir sites marked out on the maps, or to get the land which can be irrigated segregated from other lands, and as we have spent \$350,000 with no good results, I am willing to quit and let the people do the balance. Repeal these laws, restore the *statu quo* as it was before this law was passed."

The Senate, *nem. con.*, struck out the House provision and substituted the following: "For topographic surveys in various portions of the United States \$300,000, one-half of which sum shall be expended west of the 101st meridian; and so much of the Act of October 2, 1888 as provides for the selection and location of reservoirs and canals upon the public lands, and the reservation of irrigable lands, is hereby repealed: Provided, that reservoir and canal sites heretofore located or selected shall remain segregated and reserved from entry or settlement until otherwise provided by law."

The House of Representatives yielded to this proposition in a modified form, viz.: "For topographic surveys in various portions of the United States, \$325,000, one-half of which sum shall be expended west of the 100th meridian; and so much of the Act of October 2, 1888, as provides for the withdrawal of the public lands from entry, occupation and settlement, is hereby repealed, and all entries made or claims initiated in good faith, and valid but for said Act, shall be recognized and may be perfected in the same manner as if said law had not been enacted, except that reservoir sites heretofore located or selected shall remain segregated and reserved from entry or settlement as provided by said Act, until otherwise provided by law, and reservoir sites hereafter located or selected on public lands shall in like manner be

reserved from the date of the location or selection thereof. No person, who shall, after the passage of this act, enter upon any of the public lands with a view to occupation, entry or settlement under any of the land laws, shall be permitted to acquire title to more than 320 acres in the aggregate, under all of said laws, but this limitation shall not operate to curtail the right of any person who has heretofore made entry or settlement on the public lands, or whose occupation, entry or settlement is validated by this act: Provided: That in all patents for lands hereafter taken up under any of the land laws of the United States or on entries or claims validated by this act west of the 100th meridian, it shall be expressed that there is reserved from the land in said patent described a right of way thereon for ditches or canals constructed by the authority of the United States."

That part of the arid land legislation of 1888, which has been repealed by this new act, has been a great check to the business of the General Land Office, and final action on entries in practically all the region west of the 100th meridian has been suspended. All these cases will now pass to patent. The provision limiting to 320 acres the amount of land that can be patented to one individual practically abolishes the Desert Land Act, and one or two other of the land laws. Under the Desert Land Act a man could make entry of 640 acres; he could also make a pre-emption, a homestead and a timber culture entry. The last three laws limited each entry to 160. The provision exempting from settlement reservoir sites, and providing for the right of way through private land for irrigating canals, is ample to carry out the proposed irrigation of the desert lands.

Several prominent assistants whose views are not in accord with those of the Director, are no longer connected with the Survey.

ALASKA BOUNDARY SURVEY.—It will not be forgotten that the United States Coast and Geodetic Survey is carrying on a preliminary survey of the frontier line between Alaska and British Columbia and the North-west Territory, in accordance with plans or projects approved by the Secretary of State. Two parties, in charge of J. E. McGrath and J. H. Turner, respectively, have been engaged near the frontier line on the Yukon and Porcupine rivers since the summer of 1889. Letters as late as June 15, 1890, have been received from Mr. McGrath.

During the summer and fall months of 1889, clouds nearly always covered the sky, so that the astronomical work of the party has been much delayed. Added to this, the rainfall has been very heavy. But the men of the party worked willingly and energetically in preparing for the winter. The wood supply in the neighborhood of the camp was poor,—not enough to last a month, so that it was necessary to go four and five miles to chop trees, which then had to be dragged from one to three hundred feet through tangled undergrowth to the streams. About 52 cords were secured.

When the party left St. Michaels, part of the supplies were left behind to be brought up in the steamboat *Arctic*, belonging to the Alaska Commercial Company, so as to reach the camp ("Camp Davidson, on Yukon River, near boundary of Alaska") not later than September 20th. Of the supplies that were carried along much the largest part was appropriated to the Porcupine

River (Turner) party, because of the uncertainty of any opportunity for later transportation to that region. But as late as October Mr. McGrath learned by messenger that the *Arctic* had been lost, before she entered the Yukon River. But few of the supplies were saved, and those in bad condition, so that when winter set in the amount of stores on hand allowed about 90 pounds of food per man per month, gross weight, which included juices, cans, etc. The amount of flour was 5 pounds a month for each man. The position was fully explained to the men, and not one asked to be discharged or expressed a wish to leave. Two men (James McLarty and James A. French) were sent down the river to a point about 150 miles below Fort Yukon, to secure if possible some of the provisions which had been sent forward from the wrecked *Arctic*. They set out on the return trip in February, with a hand-sled and a toboggan drawn by three dogs. These they loaded with flour and beans, and after seventy days' journey got into Camp Davidson on the 2d of May, having travelled 350 miles. Most of the route was gone over thrice, because they could not haul their load all at a time. They would go forward with half, cache it and go back for the remainder. When they reached camp they had only the clothes on their backs, one pair of blankets and no coats. For the last four days they cut off the tops of their boots to feed the dogs, gave them deer-skin sinew and line from the toboggan, and whatever else they could spare. Their own clothes they cached on the road.

Under date of June 15, 1890, Mr. McGrath writes that the party has been materially retarded by the nature of the weather that had prevailed, and that they

will have to remain a second winter at the camp. Monthly reports and daily journals have been kept giving a detailed account of the work done, and the manner in which the party has been employed. A collection has been made of the plants growing in the neighborhood, and all the different insects have been gathered. A number of birds were shot, but many have spoiled. The health of the party has been excellent. Mr. McGrath was unable to get any Indians to go across to Mr. Turner's camp, 200 miles north of Porcupine River; an offer of \$40, and provisions for the journey not being sufficient to tempt them. He could not send any of his own party, as he had only two dogs and these animals would not be able to take what would be required for their own needs.

CHARLESTON EARTHQUAKE OF 1886.—Three hundred and twenty-six pages of the Ninth Annual Report of the Director of the U. S. Geological Survey, just printed, are taken up by a report on "The Charleston Earthquake of August 31, 1886," by Capt. (now Major) C. E. Dutton. Twenty-four hours after broken communications were restored found a geologist of the Survey and its accomplished photographer in the streets of Charleston, making permanent record of all the most striking and important features of the great catastrophe. A representative of the U. S. Signal Service, who is now the Superintendent of the U. S. Coast and Geodetic Survey, was upon the ground a day later. The great amount of thoroughly accurate information secured by these gentlemen, supplemented by the results of a very conscientious examination by Mr. Earle Sloan of every detail in the region most affected, and by the informa-



tion secured by Ensign Everett Hayden, through a large correspondence with every part of the country where shocks were noted, is condensed by Major Dutton into a report of exceeding interest. This paper, with its striking illustrations secured by the camera, will give one an impression of the earthquake much more vivid than any of the descriptions yet published, and must remain the historic record of that great catastrophe.

Some of the photographs taken at the time show the effect of the peculiar motion of the earthquake wave in a manner much more instructive to the popular eye than those reproduced in this report, and there might have been introduced with advantage two or three illustrations of those curiously shifted monuments, of which striking photographs are shown in the Library of the Survey, from which this report is distributed.

LIBRARY OF THE UNITED STATES GEOLOGICAL SURVEY.—This Library is unique among libraries. Young as it is, it surely deserves mention here when its fame has reached even to the great book-mart of the world, and it is in 1889 spoken of in the *Leipzig Centralblatt für Bibliothekswesen* as “Eine bedeutende Fachbibliothek.”\* It is not a Library simply, but it is also a

\* Eine bedeutende Fachbibliothek ist die National Geological Survey Library in Washington. Sie wurde 1881 begründet und umfasst jetzt bereits 25,000 Bände und über 40,000 Broschüren. Der Zettelcatalog nach Autoren ist beendet; augenblicklich sind in Vorbereitung eine Bibliographie der nordamerikanischen Geologie und eine solche der officiellen geologischen Berichte der Union und der Einzelstaaten. Den werthvollsten Bestandtheil der Bibliothek bildet die Kartensammlung, die etwa 20,000 Karten enthält. Die Bibliothek ist in vorzüglicher Weise untergebracht.—*Centralblatt für Bibliothekswesen*. Leipzig, 1889, April.

“An important special library is the National Geological Survey Library in Washington. It was founded in 1881 (*i. e.*, 1882), and contains already 25,000 volumes and over 40,000 pamphlets. The card-catalogue of authors is complete; in immediate preparation are a bibliography of North American geology and one of the

book-store where books are sold and shipped to every part of the globe, and an exchange office with correspondents, as widely scattered as those of the Smithsonian Institution. These two lines of work are foreign to the library work proper, and take from such work much time, but in this case the Librarian has made them to minister to the success of the Library.

To speak more in detail, this Library has first, a Publication or Document Division, which is the custodian of everything published by the Survey, and during the seven years of its existence has borne the responsibility for 270,000 volumes of the value of over \$244,000. It distributes these by sale, and renders an account therefor through sixty-eight ledgers, by exchange with scientific institutions and individuals, and reaching thus into every quarter of the world, makes all nations tributary to the library. The number of volumes handled last year was 46,837.

It has, second, a Correspondence Division, which attends to all letters relating to these publications, and received and sent out last year 30,627 letters. All this work is done by few people by means of a system elaborated by the Librarian, which is almost perfect for its purposes, and from which almost any one who handles books can take away more than one new idea.

But it is only the third division, the Library proper, that is to be considered here.

The Library grew out of the needs of the geologists and the geographers of the Survey for working tools.

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official geological reports of the Union and of the States thereof. The most valuable element of the Library is the collection of maps, which contains about 20,000 charts. The Library is lodged in an excellent manner."

The ablest geologist, the best geographer, can only maintain his place in the foremost rank by keeping himself in constant touch with current geologic and geographic literature. He can only keep abreast of his science by having ready and prompt access to the publications of institutions of learning and science, and of scientific men all over the world. In this current geologic literature the Library is especially rich.

The student needs no general scientific library, but only such books, periodicals, pamphlets and maps as relate specially to geology, or are useful in the prosecution of the work of the Survey; but certain books and periodicals of a general scientific character, including in connection with other papers contributions to geology and geography, he must have. With this current literature of general sciences the Library is fairly supplied.

The geologist must have ready access to all those standard treatises and manuals which contain the accepted principles of geology, those classic and invaluable books, which form the canon-law of geologic science. These and other books, which are of use to the investigator of special subjects, greatly increase the value of his work. One great chapter of the Library is made up of this class of publications.

In these days of special study many very important treatises are published privately, or in small editions, and in paper covers; and the cream of almost any scientific subject is found in this ephemeral form, so soon to disappear, so hard to procure. The Library possesses a remarkable collection of this pamphlet literature, and in its manner of handling them seems to have solved the problem that has vexed librarians so long.

The work of the Survey covers the whole country and its geologists must know everything that has been done in the localities wherein they are employed. They must have at their command all those reports upon the geology of the country made by the expeditions of the United States, or by the States themselves, all those memoirs by unattached and unofficial geologists; and for comparison, the official geological reports of other countries. The collection of these official geological reports of all the earth is very complete, and the collection of those which relate to the United States is believed to be the finest in existence.

Developing the Library along these lines and rigidly excluding everything not germane to survey work, it has come to contain six well rounded groups of publications: (1) the transactions of scientific societies and scientific periodicals; (2) standard treatises geologic, paleontologic, and mineralogic; (3) official and local geologic reports; (4) those books which assist in map making, viz., mathematics, surveying, topography, geography; (5) the pamphlet literature on these subjects; and (6) maps.

The phenomenal development of this Library, but eight years old, and its approved practical utility are the results of a wise system of library economy conscientiously applied. When Mr. Charles Darwin, an accomplished gentleman and scholar, was persuaded in 1882 to leave the Library of Congress and undertake the task of making from the beginning a special scientific library, he had indeed no books to make it of, but he also had no snarls to untangle, no bad work to undo, no conservative traditions to combat. He could choose the best

methods of modern library science, and adapt them as seemed to him best in the formation and management of a library purely special, and, therefore, needing a special treatment. The Director of the Survey, who displays rare sagacity in selecting his assistants, gave a hearty and sympathetic approval to all new plans that promised well, and in this free and progressive atmosphere have been born several ideas in library economy which have settled long and vexed questions in a very satisfactory way.

Thus with carefully considered but rapid steps, the Library has advanced toward its aim of special usefulness. And yet a few of those steps have been strides.

The first one was a great stride. In 1882, soon after his appointment as Librarian, Mr. Darwin visited Cincinnati, and succeeded in obtaining from Mr. Robert Clarke the whole geological portion of his fine private library. That eminent bookseller (who, by the way, conducts a bookstore as if it were a library, and in a way that would increase the usefulness of most libraries) had been collecting for so many years, that this purchase brought the Geological Survey a remarkably complete series of the State geological reports, including those early and rare ones now so difficult to find.

To this nucleus was now and then added an additional treasure; but it was not until five years afterward that Mr. Charles H. Hitchcock, pleased with the Library and its conduct, consented to part with the very rarest of his collection, and made this branch of the Library practically complete.

Another stride was taken after the death of Dr. F. V. Hayden, when his widow sent to the Library his scientific

books, and desired the selection of all not already acquired. Although no book not needed was kept, and very valuable donations were turned over to the Academy of Natural Sciences of Philadelphia and to Oberlin College, there yet remained to the Library a considerable addition to its collection of general geology and scientific transactions.

In 1888 the library of M. Jules Desnoyers, a noted French geologist, for a long time librarian of the "Musée d'histoire naturelle," was sold at auction in Paris. It was of unusual richness in early European geology and especially in rare brochures.

Mr. Darwin entrusted his commissions to his assistant, Mr. Charles A. Burnett, who personally attended the sale, and at ridiculously low cost secured practically everything offered in the line of geology. This purchase comprised over 700 volumes and about 2,000 pamphlets on local geology, mineralogy and paleontology, artesian wells, coal, earthquakes, glaciers and volcanoes.

In 1889, Miss Francis Lea divided a large portion of Dr. Isaac Lea's scientific library between the National Museum and the Geological Survey, and Dr. W. H. Dall, acting for her, allotted to the Survey 576 books and pamphlets. In this year also the question of irrigation delegated to the Survey created a demand for the standard works upon the subject. These were not only not to be found in Washington, but could not be had in this country. The legitimate scope of the Library was enlarged to include not only works upon irrigation proper, but also the ministering subjects of meteorology, hydraulics and engineering. The most important works

on these subjects have so far been produced in foreign countries, and during the last half of the year there was secured from England, France, Spain, Germany, Italy and India a valuable collection of works, which will be of very material service to the topographer, the engineer, and the economist, in the study of irrigation.

The Library now contains 27,515 books (of which 19,243 were obtained by exchange, 8,272 by purchase) 37,957 pamphlets (of which 33,580 were obtained by exchange, 4,377 by purchase), in all 64,472 books and pamphlets. Its map cases are filled with *twenty thousand* topographic and geologic maps, classified geographically and indexed and numbered. The map-room will yet permit of limited growth, the pamphlet cases in the pamphlet room are sufficient for some time to come, but the document rooms are overcrowded, and the Library has overflowed into rooms in the basement and upon the second floor, and fourth and fifth floors of the Survey building until the difficulties of its administration are doubled. No confusion has been allowed to result from this condition; and the current work has been kept well in hand, but, more than any other part of the Survey, the Library needs a permanent and fitting home, with less public rooms for study,

For one aim in completing the Library from its American side is to make possible here the preparation of a Bibliography, or Bibliographies, of North American geology. Bibliographies of special topics will be here made by the specialists of the Survey; of these, one, that of paleo-botany by L. F. Ward, is about complete. A general bibliography of North American geology is preparing under the eyes of the Librarian, and although



this cannot be published for some years, it is probable that that part of it which embraces the official geological reports of the States and of the United States can be issued separately within a twelvemonth.

BOARD ON GEOGRAPHIC NAMES.—The United States Board on Geographic Names, heretofore acting by authority of the heads of the several executive departments represented, has been formally constituted and consolidated by the following executive order :

As it is desirable that uniform usage in regard to geographic nomenclature and orthography obtain throughout the Executive Departments of the Government, and particularly upon the maps and charts issued by the various Departments and Bureaus, I hereby constitute a Board on Geographic Names, and designate the following persons, who have heretofore co-operated for a similar purpose under the authority of the several Departments, Bureaus and institutions with which they are connected, as members of said Board: Prof. Thomas C. Mendenhall, U. S. Coast and Geodetic Survey, chairman; Andrew H. Allen, Department of State; Capt. Henry L. Howison (U. S. Navy), Lighthouse Board, Treasury Department; Capt. Thomas Turtle, Engineer Corps, War Department; Lieut. Richardson Clover (U. S. Navy), Hydrographic Office, Navy Department; Pier-son H. Bristow, Post Office Department; Otis T. Mason, Smithsonian Institution; Herbert G. Ogden, U. S. Coast and Geodetic Survey; Henry Gannett, U. S. Geological Survey; and Marcus Baker, U. S. Geological Survey.

To this Board shall be referred all unsettled questions concerning geographic names, which arise in the Ex-



ecutive Departments, and the decisions of the Board are to be accepted by these Departments as the standard authority in such matters.

Department officers are instructed to afford such assistance as may be proper to carry on the work of this Board.

The members of this Board shall serve without additional compensation, and its organization shall entail no expense on the Government.

BENJ. HARRISON.

EXECUTIVE MANSION, September 4, 1890.

Lieut. Richardson Clover, U. S. N., of the Hydrographic Office, Navy Department, has been chosen by the Board as secretary, and all official communications for the Board are to be addressed to him.

There has been no session of the Board since the last letter to the BULLETIN. The next meeting will be held in October.

COAST PILOT OF CALIFORNIA, OREGON AND WASHINGTON.—Mr. George Davidson, of the U. S. Coast and Geodetic Survey, relates some interesting facts in connection with the publication of the *Pacific Coast Pilot*, the 4th edition of which, entirely re-written, has recently appeared.

The first edition was undertaken during 1854-58. It was written wholly outside of official hours and duties, and part of it was first published in one of the daily journals of San Francisco. His earlier duties on the coast in 1850-54, in the determination of geographical positions, from Mexico to British Columbia, and in examining sites for light-houses, had somewhat familiarized Professor Davidson with the general features of

nearly every mile of the sea-board. When he had written the matter of the first edition and offered it to Superintendent Bache, the latter at first hesitated about receiving it, because he had known nothing of it officially, but finally accepted it upon Mr. Davidson's assuming the responsibility for the accuracy of the work. A second edition was called for in 1862, and a third in 1869. In these editions new material was added with as little change by re-writing as practicable. In 1880, when the Superintendent called for a fourth edition, it was found that the vast amount of new data could not be interpolated, so the work was entirely re-written, and it has grown to three or four times the size of the third edition (721 pp., 172 plates).

This volume states what is known of the Pacific Coast of the United States from the southern boundary of California to the northern boundary of Washington, embracing over 3,120 miles, including islands in Washington and the shores of Puget Sound.

Mr. Davidson has undertaken a scheme for photographing the whole sea-coast both for land-fall and for special objects.

**HYPSONOMETRY.**—The United States Coast and Geodetic Survey has recently published two contributions. (1) Heights from geodetic levelling between New Orleans, La., and Wilkerson's Landing, Mississippi River opposite Arkansas City, Ark., 1879-1881. Field-work by O. H. Tittman, Andrew Braid, J. B. Weir and J. B. Johnson. Reduction by C. A. Schott. (2) Heights from geodetic levelling between Mobile and Okolona, 1884-1887. Observations by J. B. Weir and J. E. Mc Grath. Reduction by C. A. Schott.

GATHERING OF SCIENTISTS.—The American Association for the Advancement of Science, which has just closed its annual meeting at Indianapolis, adjourned to meet in Washington next year, probably about September 1. At about the same time it has also been decided to hold the much-talked of International Geological Congress. On this account the Association for the Advancement of Science has invited the prominent scientific men of Canada and the Latin countries to the south, with a view of making it a great Pan-American event.

Professor Mendenhall, Superintendent of the Coast and Geodetic Survey, who is deeply interested in these meetings, anticipates that the occasion will bring to Washington from 1,000 to 1,500 scientists, 200 or 300 of whom will be from European countries. It will, in all probability, be one of the most important meetings of scientific men ever held on this continent.

ASTROPHOTOGRAPHIC CONGRESS.—The Naval Observatory has incorporated with its volume of "Washington Observations," an appendix, containing Lieutenant Winterhalter's account of Proceedings of the International Astrophotographic Congress held in Paris, in 1887. The Congress was composed of fifty-eight members, representing sixteen different nationalities. The delegates from the United States were Lieut. A. G. Winterhalter, of the U. S. Naval Observatory, W. L. Elkin, of the Astronomical Observatory of Yale College, and the late C. H. F. Peters, of the Litchfield Observatory, Hamilton College. The latter gentleman represented also the American Academy of Arts and Sciences.

The object of this gathering of eminent astronomers

was to lay the foundation for the construction of a chart of the heavens by photography. The character of the instruments to be used was determined, and many other matters to enable an observer in any part of the world to engage in the undertaking with a correct understanding of what the others were doing, so that he could make his work correspond with theirs. The heavens will be divided into zones, beginning with the north pole. Each zone or section will be five or ten degrees in width, and it will be assigned to some observatory in convenient latitude. There is a chain of observatories in this stellar confederation, that will cover every inch of the sky, both in the northern and southern hemispheres.

One of the results hoped for, from the proposed photographic charting of the sky, is the relief of practical astronomers from much of the most wearying drudgery of their work. The stars are catalogued now by the most patient toil. Of course the photographs will not do away with all necessity of observations in the usual manner, but they will greatly assist the astronomer. Another advantage claimed for photography is, that the element of "personal error" is almost wholly eliminated from the operation. The correctness of the record will not depend on the accuracy of the eye and hand of the observer.

In connection with Lieutenant Winterhalter's mission to this Congress he was commissioned also to visit the observatories of Europe, taking cognizance of modern improvements and bearing in mind the necessities of the new Naval Observatory, now in process of erection. The results of his investigations are now published in connection with the Proceedings of the Astrophotographic

Congress, in a quarto volume, in which he details the history, personnel, construction and instruments of upwards of fifty of the European observatories. The volume contains also views and plans of prominent observatories and instruments in use.

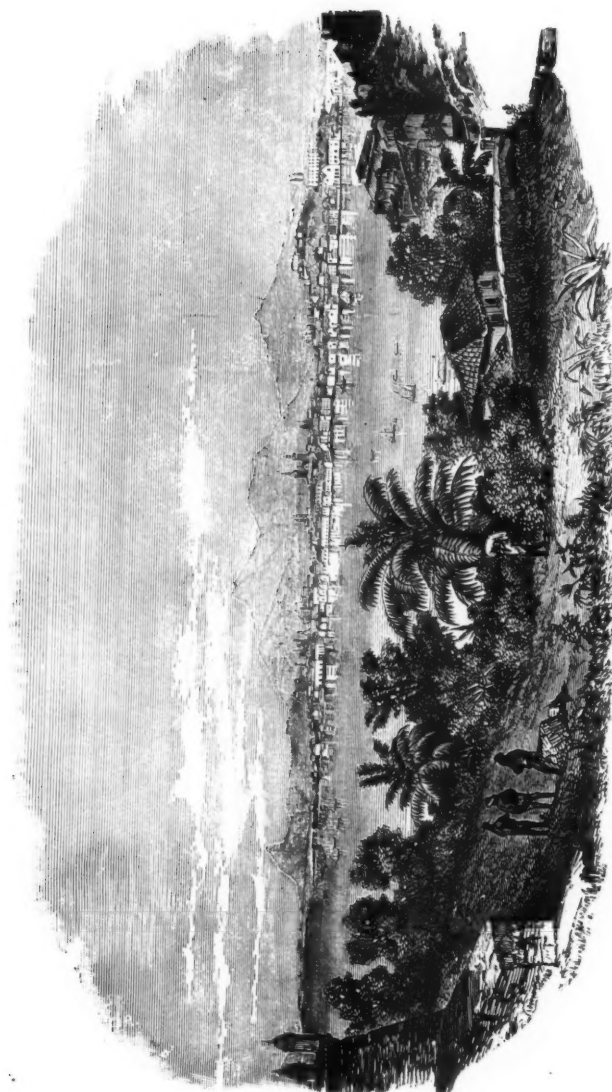
AMERICAN FORESTS.—At a recent meeting in Berlin of the Geographical Society, Chief Forest Master Kessler called attention to the waste of timber in the United States. Among other details Mr. Kessler spoke of the destruction of forests in the United States during recent years. Quoting from the tenth census, he stated that in 1880 the 25,708 saw-mills then in operation converted \$120,000,000 worth of raw timber stock into various kinds of lumber, and he asserted that, at the same rate, there would be no good-sized timber left in forty years. He spoke of the enormous waste of wood by forest fires, which are the result for the most part of carelessness or a desire to clear land for cultivation, and declared that the planting of new forests, which has received some attention in the Eastern States, cannot begin to offset the waste. He said that there was reason to fear that America will soon be impoverished for tree property. Mr. Kessler made the striking comparison that while the United States had but eleven per cent. of its area covered by forests, the empire of Germany has twenty six per cent. of its entire area so covered. He said that the reckless destruction of trees in America and the indifference of Americans to the restoration of forests is a menace, not alone to the wealth of the nation, but to climatic conditions and the fertility of the soil.\*

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\* Communicated by Consul H. F. Merritt to the Dept. of State.

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RIO DE JANEIRO FROM THE ISLAND OF COBRAS.